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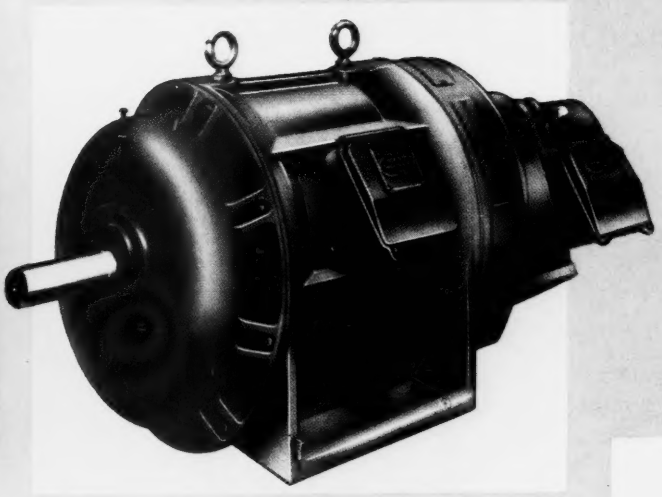

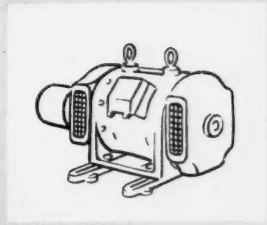

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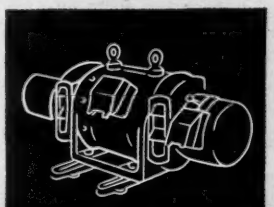

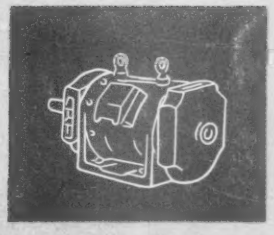

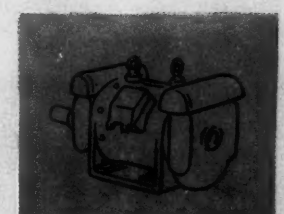

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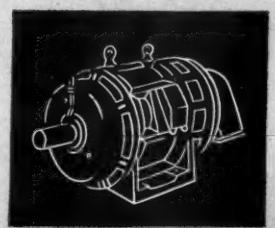

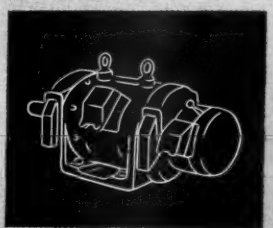

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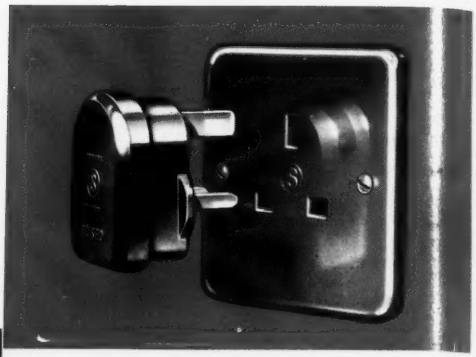

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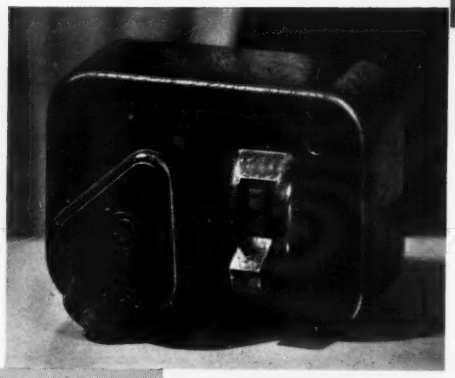

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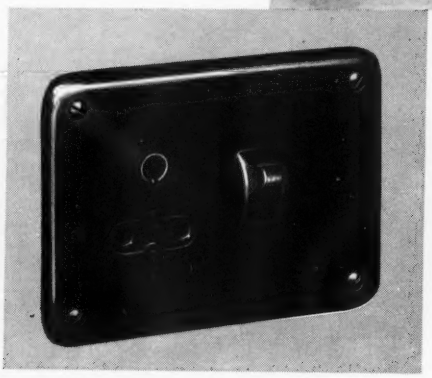

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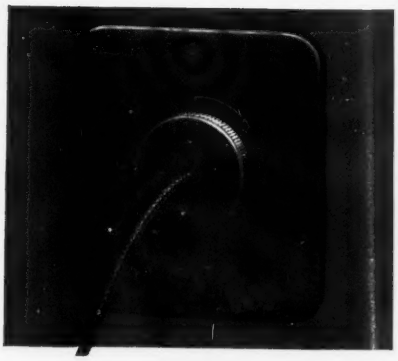

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16 DECEMBER 1955

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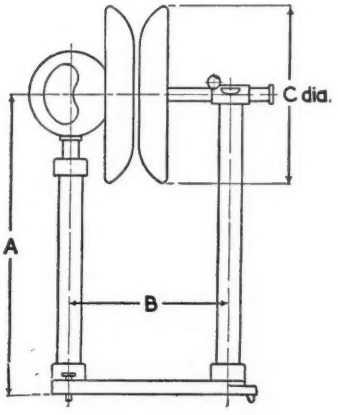

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ELECTRICAL REVIEW

16 December 1955 Vol. 157 No. 25 Established 1872

Boards or Ministries?

THOSE who are against nationalization in principle have hitherto been somewhat mollified by the system adopted in this country of setting up separate boards to administer nationalized industries instead of putting them in the hands of Government Departments. General supervision, decisions on matters of broad policy and appointment of the board members have been entrusted to Ministers through whom the boards are answerable to Parliament, as representing the public. But, quite correctly, the Ministers have declined to become involved in questions of what is termed " day-to-day " management. Having appointed people who, presumably, are qualified for their positions, the Ministers have been content to leave them to carry on their business on commercial lines.

For some time past a feeling has been growing up that the boards have become too independent and that their " accountability to the public " is too tenuous. Some M.P.s consider that too few opportunities are given in the House for questioning some of the actions of the boards. This is one of the points put by Mr. William Shepherd, a Conservative Member, in a letter to *The Times*. He suggests that the avowed purpose of the setting-up of State corporations—to avoid the trammels of bureaucracy—has not been achieved. His remedy is to hand over nationalized services to specially-appointed Ministers; this, he says, " would result in the present duality of control being brought to an end and the nation as owner would have its voice through elected representatives."

The only drawbacks which Mr. Shepherd mentions are that of the Parliamentary question (the dangers of which he thinks have been overstated) and the more serious difficulty of the Treasury method of accounting. He realizes that the latter would prove a handicap to the industries concerned but he considers it possible to devise an alternative system for those departments which are commercial in character.

The matter of accountability to the public was thoroughly dealt with in 1952–53 by the Select Committee on Nationalized Industries which recommended the appointment of a committee of the House of Commons to watch the activities of the boards and keep the House informed of these activities. The objections advanced against such a committee would probably apply with greater force to operation by a Government Department. Fear and caution might be engendered which would ill suit a progressive industry such as, for instance, electricity supply. Political pressure could easily result in lopsided development or repressive measures in place of the steadily-pursued expansion policy which is needed. There is, too, the added danger that the Chancellor of the Exchequer might regard such Departments as proper sources of contributions to the national revenue, as in former days some municipal authorities extracted " rate relief " from their electricity undertakings' funds.

We do not advocate the complete independence of national boards from some form of national supervision but so far no really acceptable way of exercising it has been put forward.

HIRED APPLIANCES

An agreement between the Gas Council and the Central Electricity Authority to instruct their Boards not to enter into any new simple-hire agreements after the end of this year will be variously viewed by the Electricity Boards. Not all of them have hire schemes in force but many are continuing agreements taken over at the time of nationalization. The general impression is that the Boards would be glad to shed the responsibility for apparatus already on hire and are not anxious to take on new commitments. There are, however, two or three who have current hiring schemes. One of them is the East Midlands Board and the Area Consultative Council has entered a strong protest against the Gas Council-C.E.A. agreement. In dealing with this matter *The Times* quoted a Gas Council " spokesman " as saying that in the year ended with last March " £600,000 was involved in the supply of gas and electrical appliances on hire." We are credibly informed that this figure applied only to gas appliances and that (rather surprisingly) the corresponding amount for electrical appliances was in the neighbourhood of £1,000,000. In comparing these figures regard should be paid to the generally higher value of electrical appliances.

PORTABLE TOOL SAFETY

The close agreement between the figures published in the last few annual reports of the Chief Inspector of Factories confirms the persistent risk of shock run by users of portable electric tools and stresses the need for actively pursuing every means for its reduction. It is unfortunate that the standard 240 V mains supply, although admirable for most purposes, can cause fatalities if defects develop in hand-held portable equipment or associated connections. Equipment operating at this voltage may be unsafe unless it is used indoors in dry atmospheres and where there is no earthed metal work or conducting flooring, as in factories engaged in the lighter industries, where the portable equipment is used at wooden benches and the floors are non-conducting. Portable equipment is too often used in situations where a defect may well cause an accident. Quite rightly, the Inspector advocates a reduction in the operating voltage of portable tools used under these conditions. Supply voltages of 110 V and 50 V ensure relative freedom from serious accidents so the opportunity should be taken whenever possible to install a low voltage distribution system, particularly when factories are being built or extended.

AUSTRALIAN IMPORT TRADE

The Sydney correspondent of the *Chamber of Commerce Journal* reports that the Australian Tariff Board has rejected the suggestion that there should be an all-round increase in import duties as a substitute for import licensing. The Board says that competition is important and protective duties stifle competition. The duties would also raise the cost of landed goods, increasing the burden on export industries. It is well to have this assurance but British manufacturers will say that import licensing also tends to stifle competition in some directions. Either system is a regrettable necessity to be abandoned as soon as possible. Reference is made by the Board to the need for Australia " to match the depreciation and investment allowances which the U.K. Government extended to competing industries in Britain " to avoid applications for protection. Any advantages to British manufacturers from this source must surely be cancelled out by higher taxes. The correspondent reviews a survey made by the Commonwealth Division of Industrial Development which indicates that Australia's major programme of power development presents a large market for heavy electrical and mechanical equipment. In the meantime the Australian heavy engineering industry is developing.

ROLLING MILL CONTROLS

The research cold rolling mill for steel strip which has been installed at the Sheffield laboratories of the British Iron and Steel Research Association, the instrumentation scheme of which was the subject of a paper presented before the Measurement and Utilization Sections of the Institution of Electrical Engineers this week (reported in this issue) is an excellent example of advanced automatic control. Here is a case where, it would seem, practically all drives but the main one are subjected to automatic control to produce extreme accuracy. To mention only one example of this, there are the gauge deviation limits of the screw-down motors of ±0·0005in. We are a little uncertain as to whether one of the several definitions of automation we have heard would fit this production scheme, but the scheme as a whole, embodying the main drive, power transmission, manipulators and other auxiliary drives, under automatic control and consequently with advanced instrumentation, is a production unit of a very high order of which the electrical industry can rightly be very proud.

RADIANT AND/OR CONVECTION HEATING

One of the adverse effects of the war and its aftermath has been the somewhat crude manner in which electric space heating, particularly domestic space heating, is now handled. Before the war the many aspects of space heating were gradually being evolved into a pattern through discussion and the general educational methods of the electrical industry. Some of the questions which were being considered were high-temperature or low-temperature heating, radiant or convection heating, and automatic control (where, when and of what?). Then for several years the buyer felt himself lucky to get any form of heating equipment at almost any price. The ill-effects of this persist and reflection on this point reminds us of the late Dr. Ferranti's case for a combination of convection and radiant heating for the home. The scheme embraced some form of convection heating which was essentially at low temperature and served as a " base load," being left switched on for comparatively long periods, and a " peak load " of radiated heat which was to be switched on and off at the door as an occupant entered and left the room. What a great pity it is that such a refinement as this scheme is not an issue to-day when the necessity to obtain the utmost from electric space heating is greater than it has ever been.

Radioactive Measurements

THE ROLE OF ELECTRONICS IN APPLIED RADIOACTIVITY

By J. L. PUTMAN, M.A., F.Inst.P.*

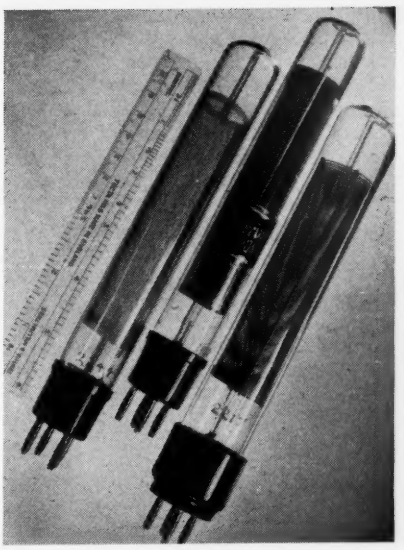


Fig. 1.—Some typical gamma-ray Geiger-Müller counters

THE increasing use of radioactive substances in medicine, in industry and in scientific research has brought in its train an increasing demand for radiation detectors and for automatic means of analysing and displaying their responses. The object of this article is to illustrate the part played by some of these instruments in the application of radioactive techniques.

Some of the earliest measurements of radioactivity were made by counting the tiny flashes of visible light produced when alpha particles strike a zinc sulphide screen. This was done with the aid of a microscope in a darkened room and from the number of scintillations seen in the objective of the microscope, the number of alpha particles striking it in a given time could be deduced. Apart from the physical discomfort of the observer, which was offset to some extent by his scientific enthusiasm, the counting rates were limited to 5 per second at the most, and the recording of sufficient counts for statistical reliability was a long and tedious business.

Modern Counters

The advent of the Geiger-Müller counter in 1928 enabled the counting rate to be increased enormously. Modern Geiger-Müller counters can record counting rates up to 300 or 400 counts per second, or higher, with some sacrifice of accuracy. Proportional counters can operate up to 10,000 or 100,000 counts/sec.

In essence the Geiger-Müller counter is a cylindrical conducting tube (see Fig. 1) containing gas and/or vapour at a pressure of a few centimetres of mercury and having a thin wire stretched along its axis. The outer cylinder, which is the cathode, is normally earthed. The " centre wire " is the anode and is raised to a positive potential, generally around 1,000 V, such that the tube is in a condition of incipient discharge. In this condition the passage of an ionizing particle or other radiation through the counter triggers off a transient discharge. The pulse of current thus passed is fed through a load resistor to develop a potential impulse which operates the recording circuits. In Geiger-Müller counters the pulse amplitudes are all equal, depending only on the applied potential and independent of the number of ions originally formed by the ionizing radiation. The amplitudes of the pulses may be from 1 to 20 V in typical counters and are usually sufficient to operate recording circuits without further amplification.

Geiger-Müller counters are widely used in routine counting operations where simple, rugged and reliable operation is essential. Those which are used for the less penetrating radiations such as beta particles are fitted with thin windows of mica or metal foil, or have thin walls to permit passage of the radiations into the sensitive volume. Halogen quenched counters have recently been developed which will operate at potentials of 300 to 400 V and have very long operating life.

Proportional counters are of similar construction, though the gas fillings are generally different. A Geiger-Müller counter, operated at a lower potential can be made to work as a proportional counter. The pulse amplitudes from these counters are proportional to the number of ions initially formed by the ionizing radiation and are generally much smaller than those from Geiger-Müller counters. Stable amplifiers with gain factors of the order of 10,000 are needed. The amplified pulses, when analysed into size classes are measures of the ionizing power of the radiations and therefore of their nature and energy. At present the use of proportional counters is largely though not entirely restricted to nuclear research. Their ability to work at atmospheric pressure or higher has led, however, to the development of unsealed " gas-flow " counters which facilitate the insertion of samples inside the counter itself.

By the use of the photomultiplier the original method of counting

* Isotope Division, A.E.R.E., Harwell.

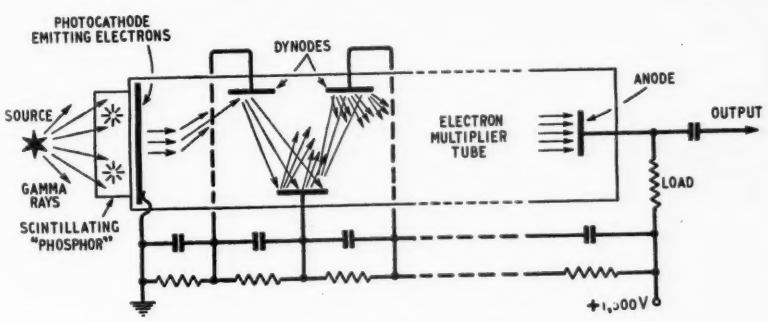


Fig. 2.—Schematic diagram of a scintillation counter

scintillations has been transformed into a high-speed detector of great sensitivity (see Fig. 2). Though zinc sulphide is still often used for alpha particles, the phosphor generally takes the form of a transparent crystal within which scintillations are produced by beta particles or gamma rays. These scintillations give rise to electron emission from the photocathode of the multiplier and a cascade of electrons is produced by successive multiplication as secondary electrons are emitted at the dynodes. The current pulse is developed across a load resistor attached to the anode and may be of sufficient amplitude to operate the recording circuits, though amplifiers are sometimes used.

The scintillation counter is the most efficient detector of gamma rays at present known and can operate at counting rates up to 100,000/sec. An important property of scintillation counters using inorganic phosphors (such as sodium iodide) is that the pulse amplitudes delivered are proportional to the energy lost in the phosphor by the ionizing radiations. When used in conjunction with a kick-sorter, which analyses the pulse amplitudes, the scintillation counter can be used to distinguish between radiations of different energies.

Tracer Applications and Presentation

The most important use of the electronic counters discussed above is in the detection of radioactive materials used as tracers. Since radioactive isotopes are almost indistinguishable, chemically, from stable, naturally occurring isotopes of the same element, they can, when thoroughly mixed with inactive material, behave as a label by which a particular element can be detected. Further, if the labelled material passes through any chemical process, the radioactivity is always a direct measure of the quantity of the element present. This fact is the basis of a vast number of applications of radioisotopes, especially in industry and in medicine, particularly in the study of complex biochemical reactions not easily followed by other means. Some of the ways in which the tracer principle has been applied in the electrical industry have been described by Jefferson (see *Electrical Review*, 9th December).

In designing a radioactive tracer experiment, first the isotope and the type of detector have to be chosen. The method of recording the impulses from the detector must then be decided. These can either be added up with a scaler, which will register the total number of impulses delivered in a given time, or their rate of arrival can be measured with a ratemeter, which can, if desired, incorporate a recording meter.

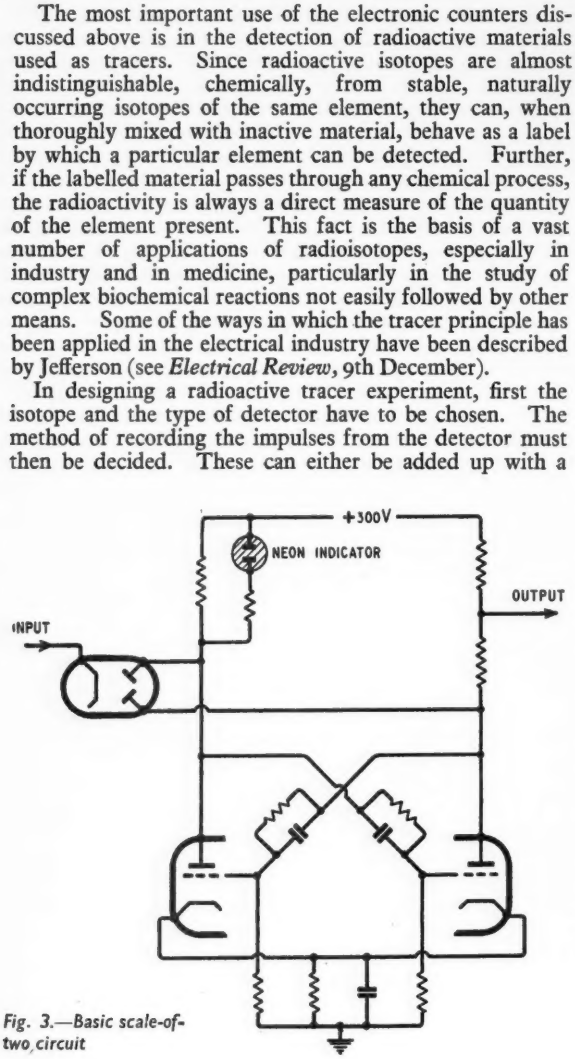


Fig. 3.—Basic scale-of-two circuit

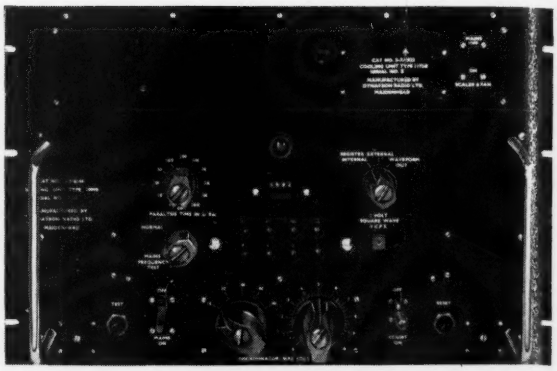


Fig. 4.—Decade scaler type 1009B

Fig. 5.—"Dekatron" scaler type 1221B

Many conventional hard-valve scalers capable of handling counting rates up to 100,000/sec or more are based on an original scale-of-two circuit due to Eccles and Jordan (see Fig. 3). This is essentially a "flip-flop" having two stable conditions, with one or other valve conducting. A single negative pulse applied to the grids reverses the conditions: a second pulse returns the system to its original state. Thus a negative going impulse can be obtained from either anode once for every two pulses supplied to the grid.

Early scalers consisted of a series of units of this type, each scaling down by a factor of two, thus providing a binary system of recording. After scaling down by a factor of 2^{10} or 2^{12}, output pulses were then applied to an electromagnetic relay recorder capable of dealing with the reduced count rates.

In this country, however, users rapidly became tired of operations which involved multiplying recorded figures by factors like 1024 and 4096, and a decade type of scaler was developed, based on unit scales of 2. Fig. 4 shows one of these in which an electronic scale of 100 operates a mechanical four-figure recorder. Tens and units are indicated with neon tubes operated by the electronic circuits. This type of scaler is capable of operation at counting rates up to about 500/sec, limited only by the speed of the mechanical recorder. An additional electronic scale of 100 can be inserted if higher counting rates are required.

The more recent development of "Dekatron" tubes has greatly simplified the circuitry and display required for a scale of 10, subject to a limitation of counting rate to about 100/sec. In the "Dekatron," a small localized gas discharge is made to revolve around the face of the tube

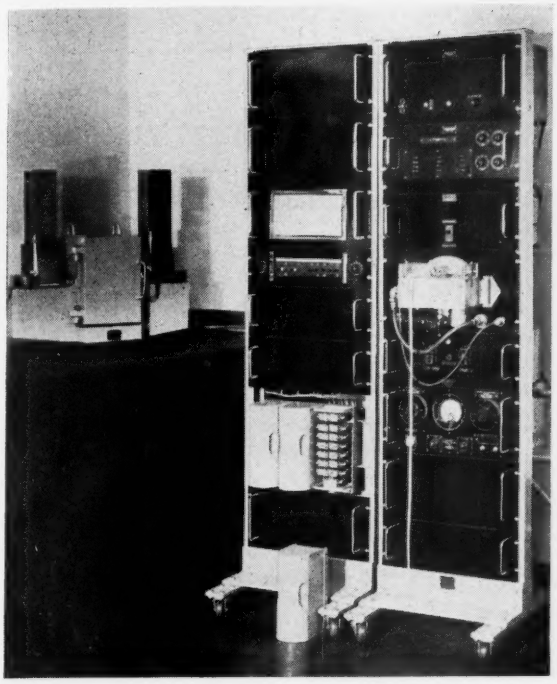


Fig. 6.—An automatic sample changer and recorder

in ten discrete steps initiated by the incoming pulses. Fig. 5 shows a complete unit of five stages. " Dekatron " scalers are small and compact and are also made commercially in separate plug-in units, each carrying a scale of ten, for convenience in operation and servicing. For rapid operation the " Dekatron " units can be preceded by a scale of 10 of the more conventional type. A still more recent tube, the " Trochotron " achieves a similar purpose and is more rapid in operation.

Scalers are to be recommended for tracer experiments in which the greatest accuracy is required. By recording large numbers of counts, occurring sometimes over long periods, they minimize the statistical errors which arise from the random nature of radioactive disintegrations when small numbers are counted. Corrections for counts lost in the " insensitive time " of detectors are easily made, and when low counting rates are to be measured, corrections for the random background rate can also be made accurately.

For applications in which large numbers of independent samples are to be measured, timing units are available which switch off the scaler after a preset counting period. Fig. 6 shows a fully automatic arrangement in which the sample is changed after counting and the period and total count are recorded on a tape.

In many applications, however, particularly in industry, the rapid detection of a radioactive source or a continuous record of fluctuating responses are more important than high accuracy of measurement. For example buried survey markers or cable junctions may be labelled with a radioactive source for easy detection at a later date. In another application a small quantity of radioactivity dissolved in oil is used to mark the interface between two different grades of oil in a pipe-line, and a continuous record of the counting rate as the radioactivity passes a detector on the outside of the pipe is both a record of the arrival of the interface and a measure of the intermixing

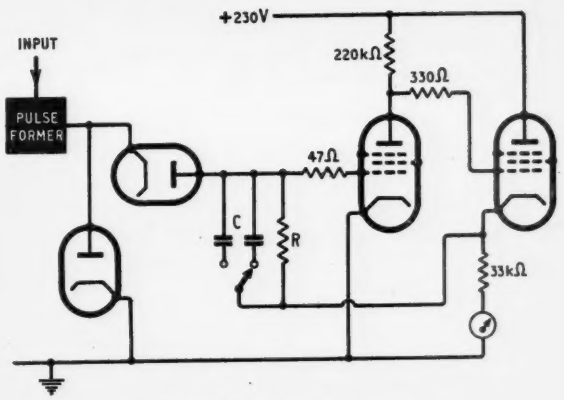


Fig. 7.—Basic ratemeter circuit

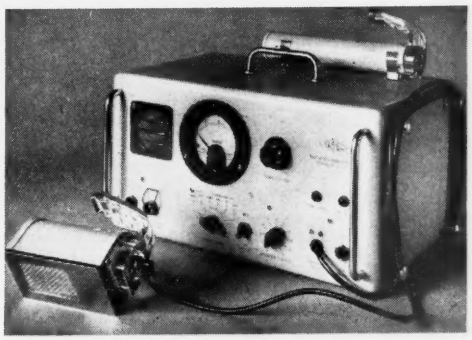


Fig. 8.—Mains operated radiation monitor (for α particles, β particles and γ rays)

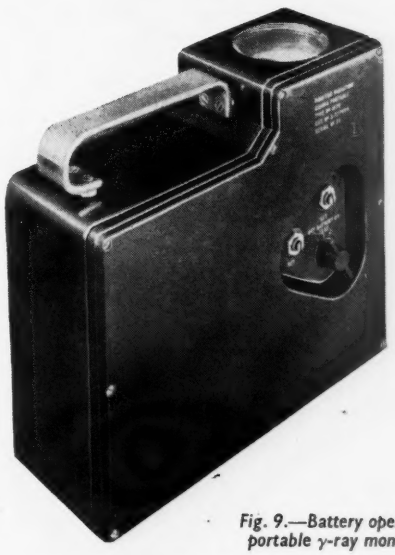


Fig. 9.—Battery operated portable γ-ray monitor

of the two oils. For applications such as these a ratemeter is to be preferred to record the radioactivity.

Essentially the ratemeter consists of a resistance (R) and capacity (C) circuit in which a fixed unit of charge is fed to the condenser for each incoming pulse. Fig. 7 illustrates a typical circuit. The statistics of ratemeters operating from random pulses is a complex subject, but it can be shown that for a steady mean counting rate, the statistical fluctuations correspond to the number of counts which arrive in a period 2RC. Thus for steady meter

readings the time constant RC of the circuit is made as long as it can conveniently be. For rapid response at the expense of statistical accuracy, the time constant is made short. Some instruments embody two or more alternative time constants (or integration times) for the convenience of the user.

Many designs of ratemeter exist, of varying complexity (see Figs. 8 and 9). One has a logarithmic response, for widely differing counting rates; another has automatic compensation for losses in the insensitive time of detectors. Many of the simpler designs are battery operated and portable, and are thus extremely convenient for field use.

Transmission Thickness Gauges

The absorption of beta particles and gamma rays in their passage through materials is the basis of a series of non-contacting thickness gauges, in which a radioactive source and a detector are mounted in fixed positions such that foils or sheets of material can be passed between them for measurement.

A typical arrangement is shown in Fig. 10, and the source is chosen so that its radiations have a penetration appropriate to the thickness to be measured. Beta particles are absorbed nearly exponentially with thickness and beta emitters can be chosen suitable for measurements of thickness within 1 to 2 per cent from thin tissue paper up to about $\frac{1}{8}$in aluminium or $\frac{3}{8}$in wood. The upper limit of measurement corresponds to a mass of about 1·2 gm/sq cm regardless of the absorbing material. For thicknesses greater than this, gamma ray gauges are used and are capable of operation at thicknesses up to a few inches of steel.

In these instruments, the main requirements of the detectors are that they shall be simple, reliable and capable of more or less indefinite operation. These conditions are fulfilled by the use of ionization chambers, and the fact that these require much larger sources is no serious limitation, since the source is an integral part of the instrument and is not, as in tracer experiments, incorporated in the measured material. Activities of the order of 10 millicuries per source are generally used. The use of a large source has the further advantage that statistical fluctuations due to the random arrival of radiations are more or less smoothed out, and the stability of the response depends only on the stability of the electronic equipment.

It is common practice to balance the current from the detector, either before or after amplification, with an opposing current which corresponds to a standard thickness of measured material. The instrument is then used as a null system in which the meter indicates departures from the standard thickness. Such a system is convenient for continuous monitoring in production, and may be used (e.g. in a rolling mill) to operate servo-mechanisms which control the thickness to keep it uniform.

The balance current may be provided electronically, in which case adjustments have to be made to allow for the radioactive decay of the source, or from a second source and detector (shown dotted in Fig. 10). The second method has the advantage that radioactive decay is automatically compensated, although the sensitivity of measuring departures from balance does fall off with time. With ionization chambers as detectors, opposition of the responses is easily achieved by supplying positive and negative potentials to the high voltage electrodes of the respective chambers and connecting their outputs to the same end of a common load resistor.

The ionization current is usually of the order of 10^{-10} A and the load resistor required is correspondingly high (around 10^{10} ohms). Insulation and screening must be of a high order and the electrometer circuits are generally

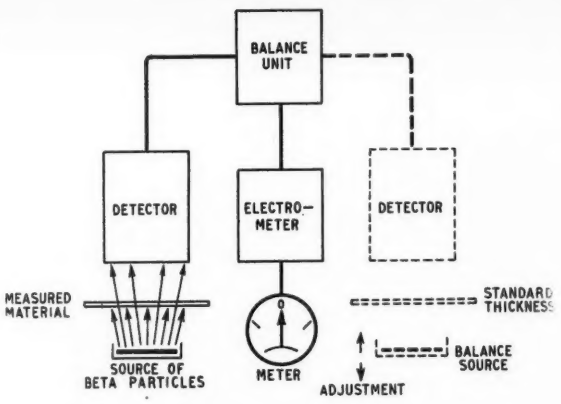


Fig. 10.—Transmission type beta-particle thickness gauge

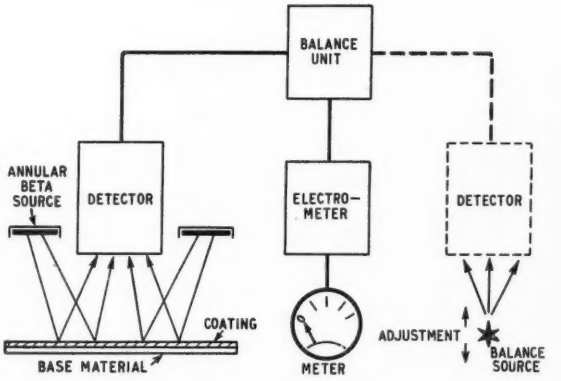


Fig. 11.—Back-scattering type beta-particle thickness gauge

rigidly connected to the ionization chambers to avoid microphony.

The two most widely used electrometers are the valve electrometer and the vibrating reed electrometer. The first employs a special electrometer valve with extremely high grid to ground impedance. This is followed by a d.c. current amplifier with negative feed-back to the base of the load resistor to ensure that the grid of the electrometer valve maintains a steady potential. In the vibrating reed electrometer, the small steady potential developed across the load resistor is made to produce an alternating current by applying it across a varying capacity. The varying capacity is provided by a condenser having, as one electrode, a plated steel reed vibrated by an electromagnet. The alternating current is then amplified by standard means. This electrometer, though rather more complex than d.c. types has advantages in stability, especially for currents from 10^{-9} to 10^{-11} A. Gamma ray transmission gauges of the same type as the above are also used for monitoring the density of liquids in tubes.

A very simple application of the transmission gauge principle has been applied to the measurement of liquid level in vertical pipes and tanks. A radioactive source and detector are mounted at the same level on opposite sides of the container. The source is chosen so that the radiations can penetrate the walls of the empty container to the detector, but are heavily attenuated when the liquid inside has risen above the level of the source. No accurate measurements of radiation intensity are required—only an on-off detector is really necessary and an extremely simple

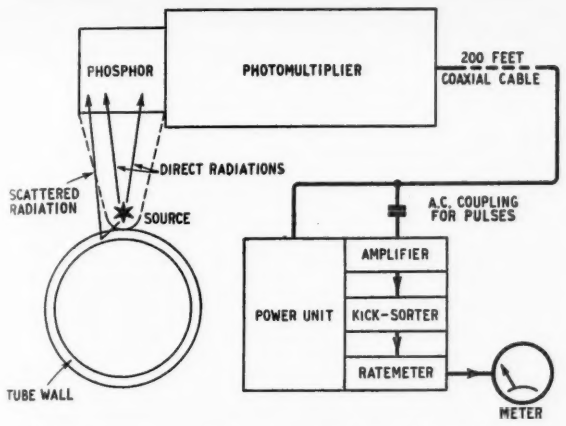


Fig. 12.—Back-scattering gamma-ray gauge (schematic)

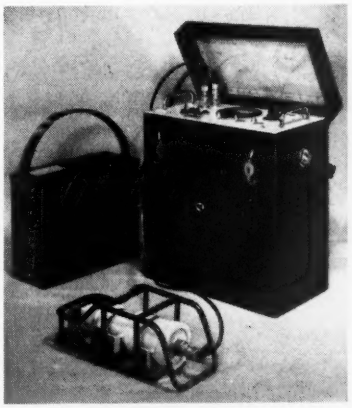


Fig. 13.—Back-scattering gamma-ray gauge

and cheap Geiger counter detector has been designed for the purpose. A similar system is in use in some factories to detect and automatically reject empty packets amongst full ones on a conveyor belt.

Back-Scattering Thickness Gauges

A further range of instruments is now produced for measuring the thickness of materials of which only one side is accessible. A typical application is to the thickness measurement of tin or cadmium plating on iron or to the measurement of paint thickness. Measurements down to 30 μin of tin have been made by the use of a beta particle back-scattering gauge. This gauge relies on the fact that the proportion of beta particles scattered back by a surface depends on the atomic number and thickness of the surface layers. A typical arrangement is shown in Fig. 11, the source of beta particles being arranged in an annular ring around an ionization chamber so that direct radiations cannot enter the chamber.

Again, a null method of measurement can be used, either by backing off the source electronically or by using a separate source and detector to provide the balancing current. In this gauge, however, the difference between readings is a direct measure of the thickness to be determined and not of its departure from a norm. The measurement thus reduces to the difference of two currents which may be nearly equal unless the coating and base materials are of widely differing atomic numbers. Much greater electronic stability is essential than in the beta particle transmission gauges, and coatings of adjacent atomic numbers (e.g. nickel on iron or steel) cannot be measured reliably by these means.

Gamma-ray back-scattering gauges are used for measuring thicknesses up to $\frac{1}{4}$in of steel when only one surface is accessible. In particular they have been used to monitor the thickness of hot-rolled steel strip and to check the wall thickness of pipes and closed tanks.

In these gauges, one of the major problems is to prevent the detection of large quantities of direct radiation from the source, which might otherwise swamp the small contribution from scattered gamma rays. In the past, heavy lead screens have been used to reduce the direct radiations, and rather cumbersome instruments resulted. It will be interesting to examine a newly developed gauge which overcomes this difficulty by purely electronic means.

The gauge, which is shown diagrammatically in Fig. 12 relies on the change in energy which takes place when gamma rays are scattered through a large angle. A scintillation counter is used as the detector and a simplified kick-sorter selects pulses of appropriate amplitude, corresponding to the reduced energy of the scattered radiations. By this means, the direct radiations from the source to the detector can be rejected, as being of too high an energy, and only the scattered radiations are recorded. No screening is used between the source and detector so that the measuring equipment is light and portable. Fig. 13 shows the complete equipment, in which the portable measuring head, incorporating only the source and scintillation counter, is connected to the power supply, kick-sorter and display unit through 100 to 200ft of concentric cable.

Demand for Electronic Equipment

We have discussed above only a few of the electronic instruments employed in the applications of radioactive materials. It is evident that the success of most radioisotope techniques depends heavily on the development and supply of suitable electronic equipment. Progress in radioactive methods and in electronic technology must of necessity go hand in hand.

A new and expanding industry is growing to provide this equipment. In the past, the main demands upon it have been for versatile instruments suitable for a variety of research applications. Many of these instruments have been large and complicated but their applicability to diverse problems in the research laboratory has made this worth while, and the convenience of manufacturing standard instruments has enabled them to be produced economically.

There is now an increasing demand for specialized instruments to fulfil specific industrial needs. These must be as simple as possible, especially in the interests of reliability. In many applications simplicity and economy are more important than extreme accuracy. As the industrial use of radioactive methods becomes more widespread, so the demand for particular specialized equipments becomes great enough to justify their manufacture on a commercial scale.

Meanwhile the demands of research workers for accuracy and greater flexibility continue. It is on striking the right balance between these two diverging requirements that future success in the nuclear electronics industry will depend.

Industrial Lighting

The December meeting of the West London Branch of the Association of Supervising Electrical Engineers was held at Holophane House, Westminster, London, S.W.1, where members were greeted by Mr. W. T. Souter (joint managing director, Holophane, Ltd.). After refreshments a lively and interesting lecture on industrial lighting was given by Mr. J. G. Holmes, B.Sc., F.I.E.S. (technical director, Holophane).

WORLD ELECTRICAL MARKETS

Developments in Iraq

By PETER F. COLLIER, A.M.I.E.E.*

SINCE the granting of the first oil concessions in the early 1920's, electrical power development in Iraq has been spasmodic and is only now beginning to stabilize itself into a planned programme which looks ahead for the next 20 years. It will probably assist many readers to understand the trend of this development, now approaching its peak, to have a brief synopsis of the country's more recent history.

The rule of the Ottoman Empire ended in 1918 and the present monarchy was created in 1921, when the British placed the first King Feisal on the throne as a result of a 96 per cent popular vote. Since 1930 the country has become politically and territorially independent but, from the engineering aspect, there is still a long way to go before even a semblance of similar independence can be achieved.

The revenue received by the Iraq Government from the earlier oil concessions was small and it was not until the signing of the "fifty-fifty" agreement in February, 1952, that Iraq became a comparatively wealthy country. In these agreements the Government receives half of the gross profits of the Iraq Petroleum Company. However, technical knowledge and trained technicians cannot suddenly appear in a country which was previously little developed. The technical future of the country is therefore in the hands of imported foreign experts, mainly British, employed by such branches of the Iraqi Government as the Development Board and the Directorate General of Municipalities; these departments are answerable to the Ministers of Development and the Interior respectively.

From the point of view of both electrical and mechanical considerations, climatic conditions are severe; in the winter temperatures fall below freezing point and in the higher altitudes of the North snow and ice are a regular feature. In the approximately six months of summer, temperatures rise as high as 125 deg F in the plains and even in the higher altitudes of 3,000ft, day temperatures of over 110 deg F are sustained. When the snows melt in the mountains in the spring, rivers become swollen and flooded and only a few years ago, Baghdad itself suffered very severe flooding when the Tigris over-ran its artificially reinforced banks. The resultant damage to power installations and lines was considerable; owing to flooding and sulphates in the soil in certain areas, armoured cables and concrete based steel poles have been known to become completely corroded away within a year. As Iraq's cement output is confined to Portland, it has been necessary to import special sulphate-resisting cement. The insulation of electrical equipment and cables has to be protected against attack by termites and other sub-human life and full tropicalization of all generator windings, metering apparatus, etc., is essential.

Existing Electricity Supply Plants

The country is divided into 14 liwas, which are similar to our own counties and each liwa has its own municipal electricity and water board, presided over by the local mutasarrif (or governor), which is responsible for the operation and administration of the different electricity supplies within the liwa. The central administrative and technical control is provided by the Ministry of the Interior and its Directorate General of Municipalities, which normally prepares all major tenders, advises on their acceptance and actually takes over the plant when installed.

There are some 75 generating stations in Iraq, all of them municipally owned except the Basra stations, which are owned by the Port Directorate, one or two small private stations and the Oil Company's plants. The situation of these plants is shown on the map and Table 1 gives a summary of installed generating capacities in the different liwas in 1953.

With the exception of Kirkuk and Baghdad, all public supply generating plant is diesel powered. In Kirkuk, the station is owned and operated by the Oil Company and employs steam turbines; the greater part of the output of this station is absorbed by the company itself, a small residue being supplied for the domestic needs of the town. In Baghdad the station is also steam and has hitherto been owned and operated by a Belgian company under licence; this concession has been terminated this year and the undertaking is now in process of nationalization. The total electricity consumed in the country in 1952 was about 207 million kWh, of which some 77 million kWh was for lighting only.

Many of the earlier plants consisted of horizontal Ruston & Hornsby engines belt driving d.c. generators and a number of them are still in operation. Earlier still, the original horizontal Hornsby engine was very popular in the primary stages of mechanized agriculture and there remains a large following amongst the local people for the horizontal low-speed engine, which will operate with comparatively little maintenance and will run on pretty well any kind of fuel.

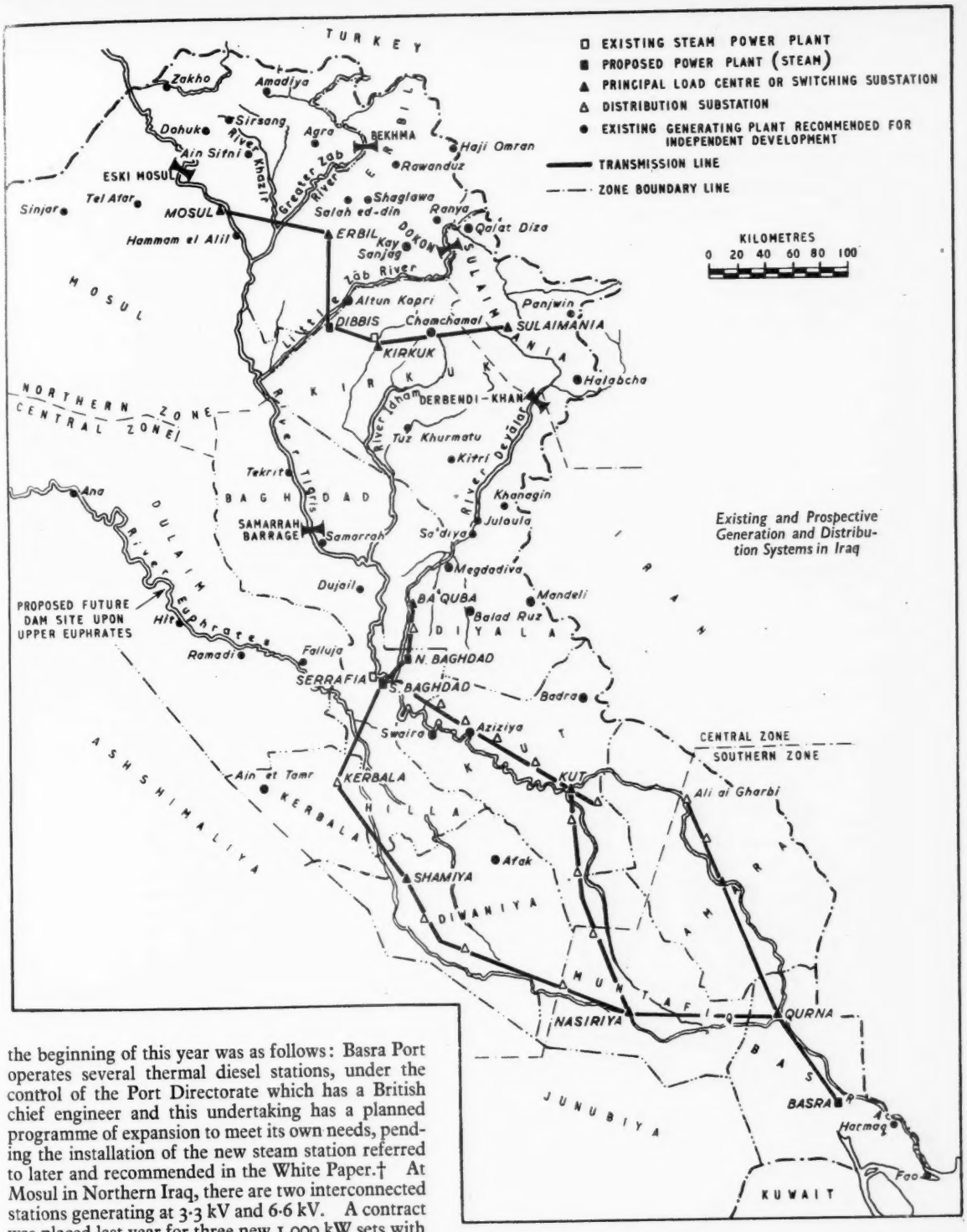
The position in the remainder of Iraq at

Table I.—Installed Generating Capacities (kW) 1953

Liwa	Population (1947)	Municipal Plants	Industrial Plants	Oil Company Plants	I.S.R. Plants
Baghdad	817,205	41,667*	7,500	556 (I.P.C.)	3,600
Mosul	595,190	3,141	600	480 (M.P.C.)	496
Diwaniya	378,118	1,493	300	—	74
Muntafiq	371,867	1,032	—	—	10
Basra	368,799	8,997	250	7,560 (B.P.C.)	—
Amara	307,021	1,134	—	—	—
Kirkuk	286,005	425	—	56,250 (I.P.C.)	—
Kerbala	274,264	3,431	500	—	—
Diala	272,413	1,059	450	240 (K.O.C.)	150
Hilla	261,206	1,831	1,000	—	—
Erbil	239,776	798	—	—	355
Kut	224,938	1,118	300	—	—
Sulaimania	226,400	705	300	—	—
Dulaim	192,983	954	400	4,640 (I.P.C.)	—
Totals ..	4,816,185	67,785	11,600	79,726	4,688

* Included, as company is now nationalized. Key:—I.P.C.—Iraq Petroleum Co. M.P.C.—Mosul Petroleum Co. B.P.C.—Basra Petroleum Co. K.O.C.—Khanaqin Oil Co. I.S.R.—Iraqi State Railways.

* Chief Electrical and Mechanical Engineer, Iraq Municipalities, Ministry of the Interior, Iraq.



the beginning of this year was as follows: Basra Port operates several thermal diesel stations, under the control of the Port Directorate which has a British chief engineer and this undertaking has a planned programme of expansion to meet its own needs, pending the installation of the new steam station referred to later and recommended in the White Paper.† At Mosul in Northern Iraq, there are two interconnected stations generating at 3·3 kV and 6·6 kV. A contract was placed last year for three new 1,000 kW sets with a German firm. In the remainder of the towns and villages throughout the country, individual diesel stations have been installed generating both d.c. and a.c. and operating mainly at domestic voltages; they contain plant with outputs varying between 25 and 1,000 kW. Some of the larger towns step this voltage up for distribution purposes within their areas.

With the signing of the "fifty-fifty" agreement in 1952, the country found itself wealthy and in a position to provide the much needed development of its agricultural and other projects. On the electricity supply side the J. & G. White Engineering Corporation, New York, was engaged to prepare a comprehensive report on the power resources of

† Report to the Government of Iraq Development Board and Ministry of Development on Power Resources of Iraq—1954.

the country, proposing a programme for the "power generating stations and power transmission construction conforming with the power demand of 1953 and also of the probable load growth in Iraq over the period of 20 years until 1973."

The White Report was produced in 1954 and now exists as an undoubted consulting engineers' achievement 3in thick and of foolscap size, in which there is contained a tremendous amount of statistical information and proposals, including theoretical figures of possible hydro-electric production between the years 1929 to 1936. This part of the report is designed to show the possibilities for hydro-electric power in the country having regard to the recorded firm flow of rivers before regulation by storage dams and after regulation. The report refers to various hydro projects and the reports and calculations of the different consulting engineers for the different barrage schemes, the main references being to the hydro-electric power chapter of the K.T.A.M. report‡ dated October, 1952, which was produced "to present a plan for the regulation of the flow of the Tigris and Euphrates which will control floods and supply water for irrigation and navigation." Consulting engineers who have been engaged in individual projects and are mentioned in the White Report are Coode & Partners, Preece, Cardew & Rider, Sir Alexander Gibb, Maunsell, Posford & Pavry, Harza Engineering Co., and Binnie, Deacon & Gourley.

The White Report deals with the economic aspects of the various methods available for developing the supply of electric power in the country by diesel, steam or hydro prime movers. The conclusions reached, and accepted in principle by the Iraq Government, are that the present comparatively low demand, cheap fuel and high capital cost cannot economically justify the immediate construction of the hydro-electric stations at the sites proposed, but that the dams and reservoirs to be constructed should make provision for the possible future construction of such stations, without interference with the other uses of the dams or their operation. On the map the sites for these dams are indicated by a black bar across the appropriate point of the river.

The alternative proposals for thermal plant stations in North, Central and Southern Iraq, feeding into a grid system—but having no interconnection between North and Central plants—have now been accepted in principle and are basically as follows:—The construction of steam turbine generating stations at Dibbis, South Baghdad and Basra, with e.h.v. transmission lines as shown on the map. The initial part of the scheme was scheduled in the White Report to be in operation in its first stages by the end of 1956 but this date has now been revised to become the end of 1957 and consulting engineers (Electrobel & Traction Electricity of Belgium) have been appointed to prepare specifications and call for tenders. The first stage of the programme envisages the following plant and transmission lines:—Dibbis, three 10,000 kW sets; South Baghdad, one 20,000 kW set; and Basra§, two 10,000 kW sets. Dibbis-Erbil-Mosul, two 132 kV circuits; Dibbis-Kirkuk-Sulaimania, two 66 kV circuits; South Baghdad‖-Serrafia power station (existing), two 66 kV circuits.

The future programme, which will be subject to review every three or four years so that assessment may be made of the financial aspects and also the true growth of power demand over the period, is scheduled as indicated in Tables 2 and 3, covering thermal and (possibly) hydro-electric plants. In the latter case, at the moment it is only envisaged that provision for the possible future plant shall be allowed in the construction of the dams. In the writer's opinion, since barrages will be built anyway for flood control, irrigation and navigation, there is every likelihood of the introduction of hydro-electric generation in the not far distant future, particularly as its use elsewhere in the world should tend towards a comparative fall in the present high cost of plant and transmission over longer distances than is usual with more centrally placed thermal stations.

Table 2.—Proposed Generating Capacities (kW) 1956–1973

	No. of sets	Capacity kW each	Year
DIBBIS			
	Three	10,000	1956*
	One	10,000	1959
	One	10,000	1964
	One	10,000	1967
	One	10,000	1971
	Total Seven	70,000	
NORTH BAGHDAD			
	One	20,000	1956
	One	20,000	1957
	One	20,000	1962
	One	20,000	1963
	One	20,000	1966
	One	20,000	1970
	One	20,000	1971
	Total Seven	140,000	
SOUTH BAGHDAD			
	One	20,000	1958*
	One	20,000	1960
	One	20,000	1964
	One	20,000	1965
	One	20,000	1968
	One	20,000	1969
	One	20,000	1972
	One	20,000	1973
	Total Eight	160,000	
BASRA			
	Two	10,000	1956
	One	20,000	1958
	One	20,000	1959
	One	20,000	1961
	One	20,000	1963
	One	20,000	1967
	One	20,000	1972
	Total Eight	140,000	

* Initial installation; remainder subject to review.

Law 34 of 1955 sanctions, *inter alia*, an expenditure of £117 million up to 1959 for irrigation, drainage, dams and thermal-electric generating stations, including the 66 kV and 132 kV lines scheduled above but excluding, for the present, the two 10,000 kW units forming the new Basra power station. In addition, an interim allocation of £3 million has been made direct to the Director-General of Municipalities for expenditure on diesel-electric generation for voltages up to 11 kV. A further £33·5 million is also authorized under Law 34 for industrial and mining development.

Diesel Plant

Quoting Mosul, Erbil and Sulaimania as representative examples, the demand for more and more electric power in the town areas has made it necessary to ask for tenders this year for appreciable quantities of diesel generating plant without waiting for the bulk e.h.v. supply.

In both Mosul and Sulaimania, a contract has recently been placed with the English Electric Co. for the supply of ten 1,000 kW 6·6 kV SRL diesel alternators for the supply of electricity to two new cement plants. In Erbil, which is nominally 440/220 V d.c., three-wire, at present, the voltage in the more outlying parts of the town is down to some 160/80 V during the evening peak and there are many outstanding applications for new supply. In this station additional 500 kW and 250 kW Ruston/Crompton

‡ Knappen-Tippetts-Abbey-McCarthy.

§ The construction of the Basra station is not now being included in the first part of the programme, which is devoted to the Northern and Central areas.

‖ J. G. White recommended an additional station at North Baghdad, making three stations in all in the Baghdad area, interconnected by 6·6 kV lines; the construction of this station has, however, been held in abeyance pending further investigation by the consultants.

Parkinson sets are being installed, at present generating d.c., but running at synchronous speed. A similar voltage regulation exists at Sulaimania town and a new a.c. power station is in process of construction with contracts already let for Allen and Deutz diesel alternators of some 1,000 kW capacity in all, to take the place of the present old d.c. station. A further set of 600 kW with a similar engine to the larger output supercharged cement works sets, but naturally aspirated, is about to be ordered. In Sulaimania the water supply is dependent on electricity, helping to make the new station an immediate essential.

Table 3.—Potential Hydro-Electric Generating Capacities

Name of Dam	No. of units	Nominal rating kW
Samarrah	Five	15,000
Derbendi-Khan	Five	25,000
Eski Mosul	Four	25,000
Damir Kapu	Four	15,000
Dokan	Four	15,000
Bekhma	Two	25,000
Bekhma	One	15,000
Bekhma	One	5,000

In fact, diesel-electric development is going ahead in most of the towns in the country, irrespective of whether or not they are on the route of the proposed e.h.v. transmission lines and may receive supply later from Dibbis or one of the other steam stations.

There are a number of towns in which local supply will in any case be continued and these are indicated on the map. Since many of these stations are small at the present time, not likely to expand greatly in the foreseeable future and often inaccessible during winter months until such time as the road programme for the whole country is complete, tenders for these stations give preference to low-speed horizontal engines (preferably below 300 r.p.m.) because, although they are admittedly expensive per h.p. initially, the engines are practically "driver-proof" and will continue to run under extremely adverse conditions with virtually no maintenance. For the larger towns, where there is a reasonably competent operating staff, supercharged engines are being installed but in the main preference is still being given to naturally aspirated low-speed vertical or horizontal engines (up to 600 r.p.m.).

All recent municipality tenders have required strict compliance with B.S.S., particularly as regards engine rating (B.S. 649) which requires a 10 per cent down rating for over 24 hours' continuous operation and various other down ratings for altitude, temperature, etc. V.D.E.¶ and other Continental ratings omit this 10 per cent. Other points on which the municipality tenders contain strict clauses is the casting of foundations and the provision of an adequate form of control to retain correct water temperatures, irrespective of load and climatic conditions, the atmospheric Heenan & Froude type of cooler being generally preferred to cooling ponds.

On the electrical side, transformers having cold rolled steel cores and low losses have taken precedence over the cheaper standard-loss transformer. Single alternator neutral earthing is called for with earth fault protection on the larger stations by means of relays or earth fault strikers. The three major factors influencing the acceptance of tenders are strict compliance with the specification, delivery terms, and the Government's conditions of contract.

Practically all electricity consumption is metered. In the municipalities, however, the meters are at present owned by the consumers and there is generally little, if any, form of meter testing in the accepted sense of the word. Proposals are now under consideration to change gradually to Government owned meters and to establish proper meter testing organizations to cover the various liwas. Existing meters vary from British to Japanese and many are very old. The new proposals envisage bulk purchasing of the long range type of meter by the Government, the purchase from consumers of existing serviceable meters and a compensation scheme for others.

¶ Verband Deutscher Elektrotechniker.

Domestic Appliances

Outside Baghdad and Basra, there is at present no great sale for domestic appliances because of the relative high cost of electricity—4½d to 9d/kWh. Even in Baghdad the present tariff has no all-in or fixed charge facility and the cost is over 3½d/kWh for the average householder. Appliances which are in use are fans, refrigerators, air coolers and small domestic appliances such as toasters, but these are generally confined to the larger towns where the supply is comparatively unrestricted. The plans for future development provide for later substantial reductions in tariffs and the introduction of alternative rates. There is practically no electric cooking because of the low cost of kerosene which, if it remains at its present rate, will always present serious competition to electricity.

In 1954, electrical equipment and appliances imported into Iraq were valued at £3,580,000. British firms had easily the largest share with £2,236,000, while the Germans had £357,000 and the Dutch £292,000; the Americans were fourth with £256,000. The 1955 total will be higher still, much of it due to municipal schemes. In domestic appliances British suppliers are behind American ones with refrigerators and behind the Dutch with radio sets. Competition is increasing all the time in both the domestic and industrial fields. To British firms wishing to do business in Iraq the best advice is (i) come out yourselves to have a look, (ii) appoint and back up an active local agent.

Training Technical Teachers

THERE are three training colleges for technical teachers in the country—in London, Bolton and Huddersfield—and each provides one-year courses of training in technical and other specialist subjects, including engineering, for both men and women from about 25 years of age. Every September when the new courses start, there are opportunities for well over 300 new students, and applications for the courses beginning in September, 1956, should be made now or very soon. Suitably qualified people from all parts of the country are eligible and admission to the colleges is in no way restricted to those living in the areas in which the colleges are situated. Each college has residential accommodation for its students. Recognized students pay no fees and are eligible for maintenance grants.

Intending students must satisfy the college authorities that they possess the necessary qualifications and experience in industry or commerce, for example, university degrees or professional equivalents, higher national certificates, final or full technological certificates of the City and Guilds of London Institute, etc.

The three training colleges are the L.C.C.'s Garnett College, at 83, New Kent Road, London, S.E.1 (118 students); Bolton Training College, Manchester Road, Bolton, Lancashire (104 students); and Huddersfield Training College, Queen Street South, Huddersfield, Yorkshire (110 students). Students at each college spend about a third of the college year of 35-36 weeks on teaching practice in technical colleges, etc., and they must take an examination leading to qualified teacher status at the end of their course. Each college has a Student Union, a self-governing body with full responsibilities and rights to organize all student activities, and a large number of college societies. Further details about the courses and the opportunities they offer may be obtained from the respective colleges.

Engineering in Europe

EXTRACTS FROM FOREIGN TECHNICAL JOURNALS

THE question of the service characteristics of cable insulation is not only of outstanding importance in technical and economic respects, but also in itself a particularly interesting and many-sided problem. It is obvious that various aspects of it change with the type of cable considered and with the specific production technology, and that others depend on operating conditions. Essentially, however, the service life of cable insulation and, therefore, more or less that of the cables themselves, will be influenced by chemical and electrical phenomena, thermal and pressure conditions inside the cable and the development of ionization processes. Particularly the last three are interrelated as they affect, and are themselves influenced by, the undesirable phenomenon of the flow of the impregnating compound which more often than not results in voids or gas bubbles forming in the insulation. The latter are the points at which ionization and subsequent discharges are developed. One very important fact is also the dependence of the gradient at the conductor surface on the ratio of the diameters of the individual strands to that of the whole core.

The effective surface gradient of a stranded conductor may be up to 30 per cent higher than that of a solid conductor of equal diameter. Obviously such a concentration of the electrical stress is most undesirable. Very promising results have been obtained with carbon-black paper which reduces the surface gradients and also absorbs gaseous oxidation products of the insulation, thereby reducing the dangers of ionization and partial discharges. The author presents many test results in addition to a comprehensive discussion of the various aspects of the problem.—" Considerations on the Stability of Cable Insulation," M. Marsal, *Elektrotech. Obzor.*, Vol. 44, No. 9, pp. 459-469, 1955, in Czech.

Asynchronous Conditions

A critical survey is presented of papers on the following related subjects:—Investigation and production of synchronous operating conditions of synchronous generators after loss of excitation; recovery of normal operating conditions after loss of synchronism; paralleling of synchronous machines by the method of self-synchronization; automatic reclosing with self-synchronization; automatic reclosing without control of synchronism; asynchronous starting of synchronous generators.

Not so long ago even short periods of asynchronous running of alternators were regarded as inadmissible simply for the reason that the essential characteristics of this state and its consequences were imperfectly known. This has greatly changed since, and the large power fluctuations in modern grids, their elaborate automatic control gear, the improved exciter systems of modern power stations (providing forced excitation for generators and compensators, if required), together with the great amount of research work done on asynchronous states of alternators, render it possible to utilize these operating conditions for bridging gaps in the supply and to bring the alternators back to normal operation after loss of synchronism, often without intervention by the operators.—" Use of the Asynchronous Operating Conditions of Generators for Improving the Reliability of the Power Supply," L. G. Mamikonyants, *Elektrichestvo*, No. 8, pp. 27-33, 1955, in Russian.

Conductor Ageing and Corona Loss

The corona laboratory of the A.S.E. and V.S.E. has previously made some important contributions to the still open question of the inter-relation between corona losses and atmospheric conditions. In the communication now presented the investigations are extended to the problem of the dependence of corona losses in rain on the surface conditions of stranded conductors: in other words, the differences between corona losses on wet, but clean, metal surfaces and on oxidized metal surfaces. It has been observed that the losses were smaller on aged conductors, but only a careful laboratory test, with microscopic investigation of the conductor surfaces, could furnish the explanation of this rather surprising phenomenon.

On a new conductor, precipitations of any kind are deposited in the form of discrete, minute droplets which act as " needle " or " point " electrodes, i.e. stimulate the typical corona discharges (tufts or streamers); an oxide layer, on the other hand, merely adsorbs a thin water film with few large hanging drops forming from excess water quantities. Owing to their large radius of curvature, the latter would hardly provide " corona electrodes." Depending on the operating voltage, the corona loss reduction by conductor ageing may amount to 25-33 per cent.—" Influence of the Ageing of Line Conductors on the Corona Losses in Rain," E. Seylaz and O. E. Gerber, *A.S.E. Bull.*, Vol. 46, No. 19, pp. 878-881, 17th September, 1955, in German.

Automatic Speed Control

An automatic speed control system for a d.c. motor with a regulating range of 2,200 to 0·8 r.p.m. without altering the exciting flux is described. The motor is rated at 4·2 kW, 2,200 r.p.m. and the control circuit consists of an amplidyne EMU-50, 4·5 kW, an asynchronous tachogenerator and a thermionic amplifier, acting as a combination of a.c. amplifier, phase-sensitive rectifier, cascade and d.c. differential amplifier, influencing the two control windings of the amplidyne.

The circuit itself combines an open-loop control circuit by means of which the desired speed value is adjusted with a closed-loop system of automatic control; the latter ensures the maintenance of the adjusted speed with a precision of 10 per cent during load changes between 25 and 85 per cent of the rated value. For an instantaneous load change by an amount not exceeding half the rated value, the transient process in the system is aperiodic and lasts not longer than 0·2-0·3 sec. The system is absolutely reliable and assures a smooth speed regulation.—" Automatic Speed Control of a D.C. Motor within a Wide Speed Range," A. M. Suchilin and E. I. Yurevich, *Elektrichestvo*, No. 9, pp. 23-24, 1955, in Russian.

Readers who require accurate full translations of any of the articles abstracted in this section can be put into touch with the translators who will supply them at current rates.—Editors, *Electrical Review*.

VIEWS on the NEWS

By REFLECTOR

IT is never too early to implant the electrical idea in the minds of the coming generation and this Christmas there are several examples of the way to do it. In all toy shops it is now customary to include among the miniature kitchen equipment model electric cookers and other appliances, some of them actually usable—in a way. I have just seen a little electric mixer made by one of the leading producers of these machines which is battery operated and capable of preparing small quantities of scones, fritters, etc., and even a one-egg omelette. A model steam iron is available which can be filled with hot water and used similarly to the larger iron. Another item is a miniature vacuum cleaner which is also battery operated and capable of small amounts of useful work. There are also, of course, the usual battery-driven locomotives and some particularly fine models of motor cars.

* * *

I am in complete agreement with Mr. G. H. Hales, of the Eastern Gas Board, who in a paper which received the first award in a recent competition said (as reported in *Public Service*):—

> "Selling semi-technical appliances often leads the salesman to indulge in technical jargon which few women can grasp . . . . How many women understand the meaning of the words 'ignition,' 'agitator,' 'radiant,' 'back boiler conversion unit' and 'circulator'? In explaining how a machine works, the salesman should use simple words which conjure up a familiar situation."

If this is necessary when selling gas appliances how much more essential it is when electrical equipment is the subject. I have heard people in electrical showrooms giving technical lectures to prospective customers who appeared to have only the dimmest conception of what he was talking about. It is not easy to explain in simple language the technical superiority of one appliance over another—but is it necessary anyway? Women customers are more interested in appearance and convenience as a rule.

* * *

Last Monday the final judging took place in a "Queen of Light" contest organized by a leading firm of lamp manufacturers. I have only just seen the regulations for the competition and find that two of them reflect the inconstancy of the fair sex. Regulation 1 stipulates, among other things, that the entrants must have blonde hair; Regulation 5 says that competitors must agree to remain blonde for twelve months following the contest.

* * *

When I referred in my notes of 25th November to the discovery of buried cables by "divining" I wandered into a field of psycho-physical phenomena which forms a perennial topic of discussion and are still unexplained. Mr. H. B. Croft, M.E.B. district manager at Cannock, tells me that it was not he but his brother who was concerned in the case which I quoted. Mr. Croft himself has several times been in the news in the Midlands on account of his divining activities. He has been very successful in locating buried metal by means of two L-shaped metal rods and he has also persuaded many other people to try their hands at it; most of them seem to have secured results. Mr. Croft says that he has never suggested that his system will normally replace the orthodox methods of locating cables but he thinks that it could be used occasionally by an unskilled worker at short notice.

* * *

While it is generally essential that the "literature" associated with equipment for export shall be in the customers' own language, it seems that the rule is not always applicable. In an article on the subject in the *Board of Trade Journal* it is said that of two islands in the Dutch West Indies, Aruba wants directions in English while Curaçao prefers Dutch. The article goes on to say that:—

> "Another peculiar variation of the problem is that it has been found in some countries where there are European residents, the local people prefer to buy goods labelled in English even if they do not understand it. If their own language is used they suspect that they may be buying something inferior to the product sold to the Europeans."

Verily the way of the exporter is strewn with unsuspected stumbling blocks.

* * *

It was announced in the *Electrical Review* of 15th December, 1905, that contracts had been placed for the electrical equipment for the electrification of the first portion of the London, Brighton and South Coast Railway. The work was entrusted to the Allgemeine Elektricitäts Gesellschaft which had had some experience in electrifying Continental railways on the h.v. single-phase system and offered a price "substantially less than any of the competing tenders." In commenting on the subject the *Review* said:—

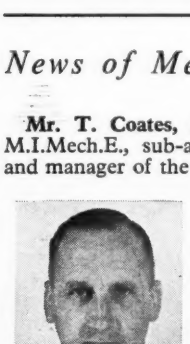
> "It must not be supposed, however, that the decision represents a total loss to this country of the large amount of employment resulting from the electrification of the railway. It is, we believe, the patriotic and enlightened practice of the L.B. & S.C. Railway to stipulate, in placing its contracts, that the work shall be carried out with British labour and material. In the present instance, while the electrical equipment for the first few trains will be made in Germany, the whole of the remaining work, including the construction of the car-bodies and trucks, the cables, switchgear, the live equipment, additional motors, and all other apparatus and equipment will be done in this country."

The *Review's* equanimity was not generally shared. In a subsequent issue it was reported that the award of the contract to the A.E.G. had "aroused a storm of protest and invective." One who protested was D. N. Dunlop, the first director of the B.E.A.M.A.; he said, for one thing, that the Westinghouse companies had had more experience in railway electrification than the German concern and their guarantees were more satisfactory.

PERSONAL AND SOCIAL

News of Men and Women of the Industry

Mr. T. Coates, M.Eng., M.I.E.E., M.I.Mech.E., sub-area liaison officer and manager of the Chester Sub-Area of the Merseyside and North Wales Electricity Board, has been appointed deputy chairman of the North Western Electricity Board. He takes the place of Mr. T. E. Daniel, M.Eng., M.I.E.E., A. M. I. Mech. E., who is succeeding Sir Joseph Hallsworth as chairman of the Board on 1st January.

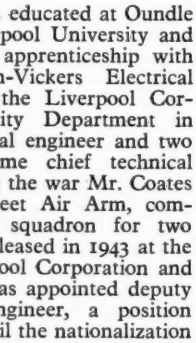


Mr. T. Coates

Mr. Coates was educated at Oundle School and Liverpool University and served a college apprenticeship with the Metropolitan-Vickers Electrical Co. He joined the Liverpool Corporation Electricity Department in 1934 as a technical engineer and two years later became chief technical assistant. During the war Mr. Coates served in the Fleet Air Arm, commanding an air squadron for two years. He was released in 1943 at the request of Liverpool Corporation and two years later was appointed deputy city electrical engineer, a position which he held until the nationalization of the supply industry when he took up his appointment with the Merseyside and North Wales Board.

Mr. Coates was chairman of the I.E.E. Mersey and North Wales Centre in 1953-54.

We regret to learn that **Mr. J. Dunford Smith,** F.I.A.M.A., advertising manager of W. T. Henley's Telegraph Works Co., Ltd., has retired on account of ill-health. Mr. Dunford Smith joined the Henley Research Laboratories early in 1920; he transferred to the advertising side of the company in 1929 and became advertising manager in 1946. He has edited the company's house journal, *Distribution of Electricity,* and he was also advertising manager of Henley's Tyre & Rubber Co., Ltd., and other Henley subsidiaries.



Mr. A. S. Brewer

Mr. Dunford Smith is succeeded by **Mr. A. S. Brewer,** M.I.A.M.A., who joined Henley's in 1922, transferring to the Advertising Department to serve under the late Mr. W. A. Moore in 1925. Since that time he has worked on every aspect of the company's advertising and he was appointed assistant advertising manager in 1954.

Mr. J. Sorrell, director of Max Stone, Ltd. (J. & M. Stone), and of Stores Trust, Ltd., has now been appointed managing director of these companies.

Mr. V. Watlington and **Mr. T. W. Heather** have been re-elected for the eleventh year in succession as chairman and vice-chairman, respectively, of the Electrical Fair Trading Council.

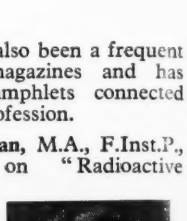
Air Vice-Marshal O. G. Lywood, C.B., C.B.E., has resigned from the board of the Automatic Telephone & Electric Co., Ltd., and **Sir Rex Hodges,** J.P., has been elected to the board to fill the vacancy.

Mr. W. F. Griffiths, B.Sc., A.M.I.E.E., F.I.E.S., has been seconded by Crompton Parkinson, Ltd., to take over from **Mr. C. J. Close** as general manager of Crompton Parkinson (South Africa) Pty., Ltd., Johannesburg. Mr. Griffiths, who flew to Johannesburg on 6th December to assume his new duties and will be joined there early next year by his wife and daughter, joined Crompton Parkinson, Ltd., as a sales engineer in 1950 after five years with Siemens Electric Lamps & Supplies, Ltd. During the war he served with the Royal Corps of Signals, attaining the rank of major. Mr. C. J. Close, who has been with Crompton Parkinson's South African company for nearly 25 years, leaves at the end of December to take up an appointment at Kitwe, Rhodesia.

Mr. W. F. Griffiths

Mr. Sam Black, F.I.P.R., has been appointed head of the Publicity Department of the British Electrical and Allied Manufacturers' Association in place of the late Mr. J. J. Conlan. Mr. Black was previously director of the Information Bureau of the Association of Optical Practitioners. He was chairman of the Institute of Public Relations in 1954-55 and editor of the *Westminster Review* and *Vision.* Mr. Black has had considerable experience of lecturing and broadcasting for the B.B.C.'s overseas programmes on such subjects as lighting. He has also been a frequent contributor to magazines and has written many pamphlets connected with the optical profession.

Mr. J. L. Putman, M.A., F.Inst.P., whose article on "Radioactive Measurements" appears in this issue, obtained his degree at Wadham College, Oxford. From 1940 to 1946 he was engaged on radar research at the Telecommunication Research Establishment, Swanage and Malvern. He then joined the Atomic Energy Research Establishment for research an geiger counters and in 1947 he formed the radioactive standards section. Since 1950 Mr. Putman has been head of the Physics and Industrial Applications Group, Isotope Division, A.E.R.E.



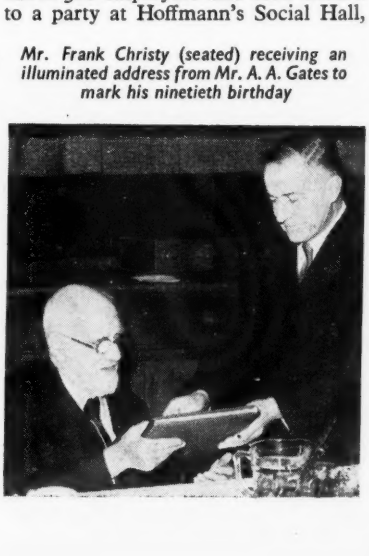
Mr. J. L. Putman

Messrs. Dowding & Mills, Ltd., have now started their own electrical contracting organization in Birmingham, and have appointed **Mr. J. Robinson** as the manager of this department.

Mr. S. G. Copping has been appointed London area sales representative with Electropower Gears, Ltd. He was previously London sales representative for Anchor Chain Co.

Mr. Frank Christy, founder of the business of Christy Bros., Ltd., celebrated his ninetieth birthday on 1st December, and to mark the event the directors entertained him and about 300 employees and their friends to a party at Hoffmann's Social Hall,

Mr. Frank Christy (seated) receiving an illuminated address from Mr. A. A. Gates to mark his ninetieth birthday



Chelmsford, on 3rd December. In the course of the proceedings, Mr. A. A. Gates (chairman) presented Mr. Christy with an illuminated address in album form, autographed by all employees of Christy Bros. and associated companies. The illuminated address, which paid tribute to Mr. Christy's work, recalled that he founded the company in 1883, and has given seventy-two years of unbroken service.

The **Telegraph Construction & Maintenance Co., Ltd.,** held its annual dinner at Claridge's, London, on 7th December. Mr. J. N. Dean, chairman, presided over a gathering of 200 guests including representatives from Government Departments, the electrical industry and cable operating companies. The principal guest was Sir Hamish D. MacLaren, K.B.E., C.B., D.F.C., Director of Electrical Engineering, Admiralty, who proposed the toast to the company. The toast to the guests was proposed by Mr. W. F. Randall, managing director, Telcon Metals Group, and Mr. C. Carnell, director, Arthur Balfour & Co. Ltd., responded.

Mr. P. C. Pritchard has been appointed assistant sales manager of George Ellison, Ltd. He will assist Mr. G. A. P. Jewiss in the general supervision of all sales activities for Ellison switchgear and will be in direct control of the internal sales organization. Mr. Pritchard was educated at Warwick School and served an apprenticeship with the British Thomson-Houston Co., Ltd., Rugby, before joining the sales engineering staff of George Ellison in 1946. After serving for a period as technical representative for Ellison switchgear in the Birmingham area, he joined the Eire agents for George Ellison, A. G. Bruty, Ltd., in 1950, being later elected to the board of that company and also of the Bruty Engineering Co., Ltd. During the last war Mr. Pritchard served in the R.E.M.E. with the rank of captain and was mentioned in despatches during the S.W. Europe campaign.

Mr. P. C. Pritchard

On Saturday last the **Association of Supervising Electrical Engineers** held its Ladies' Night at the Park Lane Hotel, Piccadilly, London, W.1, under the chairmanship of Mr. R. F. Mathieson, national chairman of the Association. Music for dancing was provided by Eddie Lee and his orchestra while cabaret entertainment was by Eric Ross and his company. After the dinner the toast "The Ladies" was proposed briefly by Mr. R. F. Mathieson, the response being made by the Dowager Lady Swaythling, president of the Electrical Association for Women.

At the recent ball of the Manchester Branch of the Electrical Industries Benevolent Association, showing (left to right): Mr. H. Etchells (hon. branch secretary); Mr. H. Cobden Turner (chairman of the Ball Committee); Lady Bishop; Mrs. Cobden Turner; and Sir Harold Bishop (president, E.I.B.A.)

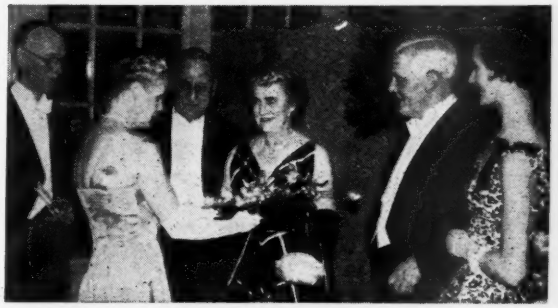
Mr. Ernest Long, secretary of the Central Electricity Authority, has been elected hon. treasurer of the Chartered Institute of Secretaries for the ensuing year.

The festive spirit was much in evidence at the annual dinner and smoker of the **Electrical Trades' Commercial Travellers' Association,** which was held on Friday last at the Windsor Castle Hotel, Victoria, London, Mr. W. Candelatt (chairman) presiding. All present were intent on enjoying themselves, and what speech-making there was, was of the briefest. Mr. N. Russell took only a few seconds to propose the toast of the Association, and Mr. R. G. Brandon (the president), in his reply, was almost as brief. He said that he had been connected with the Association for thirty years and he was proud of now being its president. He called upon those travellers who were not members to give their support to the Association. Mr. L. J. Shuter proposed the toast of the guests, to which Mr. J. P. Lough replied, and Mr. J. H. Bowen, in proposing the toast to the chairman, wished Mr. Candelatt a successful year of office. Mr. Candelatt responded and appealed for greater support at the general meetings of the Association.

The twenty-fifth annual ball of the **E.I.B.A. Northern Counties Area** was held at the Old Assembly Rooms, Newcastle-on-Tyne, on 6th December. Mr. J. Gibson, chairman of the Northern Counties Area, and Mrs. A. S. Lowrey, received 300 guests and were supported by Mr. F. C. Winfield, M.Eng., M.I.E.E., F.Amer.I.E.E., chairman-elect. In the accompanying photograph Mrs. W. R. Gledson, wife of Mr. W. R. Gledson, a member of the committee, is seen presenting a bouquet to Mrs. A. S. Lowrey, and others in the photograph are Mr. J. Gibson, chairman, Mr. F. C. Winfield, Miss Christine Parkin and Mr. A. Parkin, honorary organizer of the ball.

The Mazda "Queen of Light" Competition sponsored by the **British Thomson-Houston Co., Ltd.,** reached its climax at the Lyceum Ballroom in London on Monday of this week when this year's Queen was elected and crowned. She is Mrs. Jennifer Chimes, of Blackpool, who also holds the title of "Miss Great Britain," and was chosen from 30 regional heat winners from areas including Scotland, Ireland and Wales. Of the remaining sixteen finalists the following were chosen as runners-up:—Miss Maureen Killen, Cardiff (second); Mrs. Marjorie Scorer, Newcastle (third); Miss Brenda Mee, Tottenham (fourth); Miss Marlene Honor, Streatham (fifth); and Miss Audrey Windows, Morecambe (sixth). The winner received a cheque for £100 presented by Mr. V. C. H. Creer, "Mazda" sales director, and subsidiary prizes of either £15 or £50 were awarded to regional "Queens of Light" depending on whether or not they were placed in the first six in order of merit and £15 to contestants in the first six who did not gain a regional title.

After opening a new secondary modern school at Rugby on 9th December, the Minister of Education,



Mrs. Gledson presenting a bouquet to Mrs. A. S. Lowrey at the annual ball of the E.I.B.A. Northern Counties Area held at Newcastle-on-Tyne

Sir David Eccles, Minister of Education, sees an apprentice at work in the B.T.H. Drawing Office School, Rugby

Sir David Eccles, visited the British Thomson-Houston Co.'s works. In company with Mr. E. H. Ball, managing director, and Mr. L. J. Davies, director of research and education, he was able, by studying diagrams and models, to appraise the far-reaching educational and training schemes now being developed by the company. Sir David inspected the main training drawing office; the lecture theatre, where a display of work produced in the apprentice training workshop was on view, and also an exhibition showing the methods used in training apprentices in drawing office work; and Coton House, the main apprentice residence.

Mr. Peter F. Collier, A.M.I.E.E., the author of the article on "Developments in Iraq," was born at Wakefield, Yorks, in 1916 and was educated at Radley College, Worksop Technical College and the Regent Street Polytechnic. He received his practical training in the Worksop Corporation Electricity Department and with the Metropolitan Electric Supply Co. Just before the last war he joined the Air Ministry as an engineering assistant, E. and M. Shortly after the outbreak of war, Mr. Collier was commissioned in the Royal Engineers and after serving in the B.E.F. he was given a special staff appointment in 1940 as chief electrical and mechanical engineer in connection with a special branch of the Air Ministry concerned with building decoy sites to deceive enemy bombers.

Mr. P. F. Collier

From 1942 to 1946 Mr. Collier served in the Middle East, initially in field units and afterwards on the staff, concluding his service as Assistant Controller of Public Works, B.M.A., Eritrea. He retired with the rank of major and joined the Colonial Engineering Service in 1947. He was appointed electrical and mechanical engineer in Zanzibar and was responsible for a change-over from d.c. to a.c., including the building of a new power station. He left Zanzibar in 1954 having been Acting Director of Public Works there for some time. He is at present seconded to the Iraq Government as chief electrical and mechanical engineer in the Directorate-General of Municipalities.

Mr. A. G. Peacock, B.Sc., A.R.I.C., A.Inst.P., has been elected chairman of the Electrical and Electronics Section of the Scientific Instrument Manufacturers' Association in succession to **Mr. P. Goudime,** M.A., managing director of Electronic Instruments, Ltd. Mr. Peacock is a director of Mervyn Instruments, of Woking, and hon. exhibition secretary of the Physical Society. The vice-chairmen are **Mr. R. Y. Parry** (Ekco Electronics, Ltd.), and **Mr. L. A. Woodhead** (Cossor Instruments, Ltd.).

There was a very large gathering at the Christmas luncheon of the **Electrical Industries Club** at the Connaught Rooms, London, last Tuesday. Mr. Leslie Gamage, the president, was in the chair and he introduced the principal guest, Mr. C. Kenneth Horne, managing director of British Industries Fair, Ltd. Mr. Horne, who is particularly well known in quite another sphere, gave an address in which he combined entertainment with advocacy of the British Industries Fair. He said that their method was "salesmanship by showmanship" to attract the greatest possible number of visitors. At Olympia an electrical and electronics section was being arranged and they envisaged the future participation of many more representative sections. By taking part in the B.I.F. sections of industry would secure the benefits of the Fair's overseas publicity and the interest of a large number of overseas visitors. The B.I.F. authorities were willing to help other sections to run their own exhibitions if they preferred to do so.

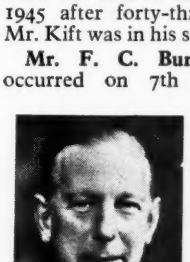
As to next year's Fair, Mr. Horne said that the ground floor of Olympia was already taken and they were rapidly filling up the gallery. The Central Electricity Authority was supporting the Fair and it was hoped to have a good domestic section.

Mr. E. G. Batt expressed the Club's thanks to Mr. Horne and then made a special Christmas appeal on behalf of the residents at Broome Park (E.I.B.A.) as a result of which £81 was collected.

OBITUARY

Mr. A. A. Kift.—The death, on 4th December, of Mr. A. A. Kift has severed yet another link with the pioneering days of radio and electronics. Mr. Kift, who was trained as an electrical engineer at Finsbury Technical College, joined the staff of Marconi's Wireless Telegraph Co., Ltd., in 1902. After a further specialized course at the Marconi Training College (then at Frinton) he was appointed to the engineering staff of the company. One of his earliest tasks was concerned with the installations aboard the first half-dozen White Star liners to be equipped with wireless. During his long career, Mr. Kift's work for the company, afloat and ashore, ranged from Labrador to the Black Sea coast, with erection of wireless stations in Britain interspersed with his foreign travel. Between 1912 and 1932 he became successively sales manager, assistant engineer - in - chief and contracts manager of the company. He relinquished the latter office upon reaching normal retiring age in 1941, but continued in the company's service until the end of the war, retiring in 1945 after forty-three years' service. Mr. Kift was in his seventy-fifth year.

Mr. F. C. Burstall.—The death occurred on 7th December at a Leatherhead (Surrey) hospital, after a short illness, of Mr. Frederick Colin Burstall, deputy managing director of the Automatic Telephone & Electric Co., Ltd., Liverpool. Mr. Burstall, who was sixty - six, joined the company in 1931 as a commercial executive. Before this he was Deputy Director-General of the Egyptian State Railways, Posts and Telegraphs.



The late Mr. F. C. Burstall

Mr. Burstall was educated at Magdalen College School, Oxford, and was for a time a member of the choir at Liverpool Cathedral, where his father, Mr. Frederick Hampton Burstall, was the first organist. He began his career in telecommunications with the National Telephone Co. in 1904, and later served with the traffic branch of the G.P.O. in Liverpool. From 1911 to 1913 he was in the R.N.V.R. and during the 1914-18 war served in France with Inland Waterways Transport. During the last war, Mr. Burstall was in command of a Home Guard unit which was formed entirely from A.T. & E. personnel.

Mr. A. Mycoe, traffic manager of the Metropolitan-Vickers Electrical Co., Ltd., died on 4th December at the age of sixty-seven. Mr. Mycoe had held the position since 1920, having joined the company originally in 1907 as chief railway clerk.

WILLS

Mr. G. Ellam, managing director of G. Ellam, Ltd., electrical wholesalers, who died on 2nd September last, intestate, left £16,778 gross (£16,721 net).

Mr. W. E. Burnand, M.I.E.E., principal of W. E. Burnand and Son, who died on 24th April last, left £64,800 gross (£55,708 net).

INDUSTRY AND THE HOUSE

Implementation of the Monopolies Commission's Recommendations

By A. M. F. PALMER, A.M.I.E.E., M.P.

VERY little of major industrial and economic interest has been before the House of Commons in the last two or three weeks, with the important exception, of course, of the Finance Bill still making its weary progress towards Third Reading. Although the Opposition might officially contend otherwise, in fact the House has had wider than usual opportunities to discuss Mr. Butler's Budget changes. Because of the Bill's drafting there have been four lengthy debates on the purchase tax increases alone—on the Budget statement itself, on the Second Reading of the Finance Bill, on the motion that the purchase tax clause "stand part" and then again when the schedule "stood part." Presumably at the Third Reading there will be a further examination of this not-likely-to-be-forgotten purchase tax.

An unprejudiced gallery observer who had faithfully attended (poor man!) the discussions since the Budget came in, many of them running into the small hours and long pages of Hansard, would, I think, give the honours for dialectical skill to the Opposition. Mr. Gaitskell, Mr. Wilson and Mr. Jay, backed by other members of the calibre of Messrs. Mitchison, Albu, Jenkins and Houghton (to name just a few of Labour's financial sharp-shooters) have succeeded in reducing the Treasury bench to the appearance of dull, stubborn endurance. Yet one cannot help feeling that this nagging debate on bitterly resented changes is an illustration of how fundamentally inadequate is our historic taxation system now to cope with the revenue-raising problems of the modern industrial welfare state.

Mr. Butler is accused of conspiring to change the still theoretically temporary purchase tax into a straight-forward permanent sales tax. There is, I believe, some truth in the charge for two reasons: first, the Chancellor has never directly denied the allegation, and secondly, all kinds of intellectual kites are flying in the more remote journals and papers of the Right. It is argued that an increased bias towards taxation on expenditure would be effective in countering inflation and be an encouragement to saving. The citizen, it is said, would be taxed on what he took out of the pool of national wealth instead of being taxed as at present on his efforts to add to the size of that pool. Yet I have a suspicion that when it comes to details it will hardly be as simple.

Automation and Electronic Devices

Among the curiosities of possible legislation is a Private Member's Bill introduced by Mr. Bob Edwards, Labour and Co-operative M.P. for Bilston, to provide for the establishment by the President of the Board of Trade of a permanent Committee to supervise the "consequences of the application of automation and electronic devices to British industry and agriculture." The proposed Committee would have a wide representation sitting on it, including publicly-owned and private industry, employers' organizations, trade unions and scientific bodies. It is probably an error to look on the development of automatic devices in industry as something apart from the normal technical progress of particular industries, but the publication of the Bill, which is far down on the list for the remaining Fridays devoted to Private Members' Legislation, may serve to direct attention to these new and fascinating changes in industrial techniques. Incidentally, Mr. Bevins, Parliamentary Secretary to the Ministry of Works, recently told Colonel Lipton that the report on automation in industry on which the Department of Scientific and Industrial Research is working could be expected early in the New Year.

The Government's Clean Air Bill is in the queue of measures patiently waiting for room in a Standing Committee. However, the Beaver Committee's recommendation that to assist a policy of clean air purchase tax on gas and electric room and water heaters should be removed, was mentioned when in the Finance Bill debates Mr. Nabarro and others pleaded for equal treatment for tax purposes of the several methods of space and water heating: solid fuel, electricity, gas and oil. It was pointed out that the present system continued the anomaly by which solid fuel and oil appliances for heating rooms and water were free from purchase tax, but gas and electric appliances were penalized at a rate now increased from 50 to 60 per cent. The Chancellor of the Exchequer has conceded the existence of a case for investigation and we may hope in the end for relief.

The Monopolies Commission

Among the commercial matters likely to cause intense parliamentary controversy when we reassemble in the New Year, particularly on the Government back benches, is the promised legislation to be introduced by Mr. Peter Thorneycroft, President of the Board of Trade, to implement various recommendations of the Monopolies Commission. Taking the House as a whole it can be said that the Labour Opposition are substantially united (with a trade union reservation here and there) in demanding that competition should be free for the good of the consuming public. The Opposition view is that private monopoly and trade restriction gives the worst of both worlds; the citizen has neither the effectiveness of competition working on his behalf nor the traditions of public ownership at his service. The Conservatives, however, tend to be divided between those who stand for the classical economics of free enterprise and those who favour a modification of that doctrine under the enlightened direction of trade associations and industrial groupings. It may well turn out when his anti-monopoly legislation comes before the House of Commons that the President of the Board of Trade will have to look across the chamber for at least some of his votes if he is to survive.

Until now, unlike in previous autumn sittings, the House has given no time to the discussion of the annual reports of the nationalized industries, although these, strengthened by a new recruit, the Atomic Energy Authority, are now available. But honourable Members have been embarrassed to receive back in their laps the once famous proposal, backed with so much argument in the chamber and outside, for a Select Committee to supervise in the parliamentary context the affairs of the nationalized industries.

The Committee tried hard to find some chink in the terms of reference given to them, but these seemed devised

ingeniously to prevent anything at all being done. It is evident that if a matter is excluded from investigation because it is either a ministerial responsibility or a day-to-day activity of the nationalized boards, then there will be little left, if anything, which does not come under one or other of the headings.

The truth is that whatever may be the feelings of their back benchers, Ministers are happy, as were their predecessors in the Labour Government, not to have too much parliamentary interference with the life of the industries and services for which they are responsible. Ministers quickly establish a working relationship with the chairmen of their boards and both are mutually jealous of interference by inquisitive private Members. It will be interesting to see if the House is now prepared to let the matter rest where it is.

LETTERS TO THE EDITOR

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Lamp Quality and Prices

IN the *Electrical Review* of 25th November (page 1028) you have reported under the heading " Lighting in Liverpool " that Mr. C. C. Smith, the city lighting engineer, stated that as a result of experiments he had carried out, ring lamps were more economical to use than non-ring lamps owing to their high standard of quality control in manufacture.

Mr. Smith has since stated that it was not his intention to convey that all non-ring lamps were inferior in quality but his comparison was intended to cover the " higher priced lamps " against the " cheap lamps."

As one of the leading non-ring companies, we consider the report is very unjust to ourselves and we wish to point out that " Ekco " general service tungsten lamps are manufactured under the British Standards Mark Scheme. Under this scheme B.S.I. inspectors regularly visit the works and check production to ensure that the lamps fully comply with the B.S. specification.

London, W.C.2. E. S. EVANS,
General Manager,
Ekco-Ensign Electric, Ltd.

Domestic Electrical Usage

READING the article in your issue of 9th December, I was very surprised that in a new housing estate a three-phase four-wire system was installed in each house for the purpose of segregating and metering of (*a*) lighting and sockets—red phase; (*b*) cooker—yellow phase; and (*c*) water heater —blue phase.

Is the local Electricity Board aware that 400 V exists in the kitchen area where the cooker is on yellow phase and sockets in the kitchen, if any, are on the red phase? Besides, a socket is incorporated in the cooker unit and with a flexible cord I am sure the reach between the kettle and other switches is within the 6ft limit (see I.E.E. Regulations 109-110). Otherwise I do think a great deal will be brought out by this test over two years. After that period I should like to read that each house is now on a single-phase supply.

Glasgow, W.3. I. C. HARRIS.

Load-Curve Analysis

IT seems unlikely that there was a lag of about forty years in the application of multiple-regression analysis to problems in the electricity supply industry, particularly on the technical side, but so far as I am aware the first application in this country to the analysis of load characteristics was that published in 1945, to which the writer of the letter in your issue of 9th December refers. In the course of a general review of cost analysis problems while in my section, Mr. Dennis became familiar with the possibilities of multiple-regression in that field, and subsequently when with the South Western Electricity Board, as he points out, made an interesting use of annual kWh sales to consumer classes in an endeavour to assess as a factor in cost analysis the shares of these classes in the annual m.d.s of Area Boards, irrespective of time of incidence.

The subsequent application of this method to individual half-hours of specific days was pursued under the ægis of the Utilization Research Committee of the Central Authority and Area Boards, but in my article, the ensuing method of load-curve analysis was described as " developed here," i.e., in this country, in contrast to a somewhat similar method recently published in Switzerland. In this context Mr. Dennis's contribution to the line of development concerned did not appear to require special mention.

London, E.C.2. P. SCHILLER.

Lighting with Heated Ceilings

THERE are a number of points in connection with the article on " Lighting Techniques with a Heated Ceiling," by A. P. Grant and A. H. Olson, in your issue of 25th November which call for some comment.

The authors' statement that the efficiency of both tungsten and fluorescent light sources falls with increasing temperature is incorrect so far as tungsten filament lamps are concerned. The efficiency of such lamps is relatively unaffected by variations in the external temperature. The filament of a 100 W lamp operates at about 3,100 deg C, and it will be clear that an increase in external temperature of 20-30 deg C can have little influence.

Fluorescent tubes, however, are designed to give their optimum light output in an ambient temperature of about 70 deg F. Operation at 114 deg F may result in a decrease in luminous output of as much as 20 per cent, and due allowance must be made for this fact in estimating the number of lamps required in a particular installation.

With regard to control gear, one would not have thought that the bitumen-filled chokes or transformers (if obtained from a reliable manufacturer) would be affected by a surface temperature of 151 deg F. Such temperatures must often be achieved in the tropics or even in many multiple-tube totally enclosed fittings in this country.

London, W.C.2.
W. A. R. STOYLE, B.SC., A.M.I.E.E., F.I.E.S.
Osram Lamp Department,
General Electric Co., Ltd.

PARLIAMENTARY REPORT

RUMOURS about the possibility of the Chancellor of the Exchequer broadening the basis of purchase tax so that it would assume the character of a sales tax caused Mr. Butler to be subjected to a close cross-examination in the House of Commons last week.

Mr. Jay and Lieut.-Col. Lipton asked him if he would make a statement on future Government policy relating to the purchase tax.

Mr. Butler replied that he had nothing to add to what he said at the Committee Stage of the Finance Bill, namely that they had no ready-made scheme for a general sales tax. Hon. Members would be very unwise to under-estimate the complexity and difficulty of introducing any such tax.

Mr. Jay asked how the Chancellor could explain the fact that there were inspired statements in the Press a week ago that there was to be a general sales tax, and then a few days later inspired statements that there was not to be one. Could he clear the whole matter up by saying now that he had no intention of introducing a sales tax? Mr. Butler said that the matter was set out absolutely clearly in the reply he had just given. The Press was free to say what it liked.

Exports to China

In the House of Lords Viscount Elibank asked the Government whether they were aware that (1) in his last annual report to the shareholders the chairman of the Hong Kong and Shanghai Banking Corporation said that "the potentialities of British trade with China are as great as they have been for over a hundred years"; (2) that Sweden and Switzerland were executing contracts for China for turbine and steam turbo-generator sets, with boiler plant and electrical switchgear, and that French and Japanese and West German concerns had contracted to supply China with various kinds of iron and steel products, of which West Germany exported to China last year some 7,500 tons, and French concerns more recently some 10,000 tons, all of which items were on the China embargo list; and whether the Government would take steps to enable British business men to compete freely on an equal footing with Swedish, Swiss, French, Japanese and West German concerns who were trading with China in these embargoed items.

Lord Mancroft, Under-Secretary, Home Office, replied that the chairman of the Banking Corporation had gone on to say that China would need to expand her exports if she wished to obtain the foreign exchange necessary to purchase industrial goods which she required. Neither Sweden nor Switzerland was a member of the consultative group in Paris but the Government did not consider that the nature and volume of the exports of these countries to China were such as to prejudice the effectiveness of the controls maintained by the members of the group, who were concerned with implementing the embargo. The other three countries were members of the group. The exports of Western Germany were made in fulfilment of commitments assumed before the consultative group had agreed on a common list of controls. As for the contracts entered into by France and Japan, although the arrangements made by the group did achieve a remarkable uniformity the controls were sufficiently flexible to take account of special circumstances and occasionally, with the full knowledge of all the members, items under embargo were exported to China by member countries, including the United Kingdom. British business men desiring to trade with China were on the same footing as those in France, Japan and Western Germany.

Lord Elibank said it was well known among business men in the major trading countries that there was a growing lack of uniformity in the application of the strategic controls on trade with China. If the present trend continued British traders would be at an increasing disadvantage in the China market. Lord Mancroft said this might be so if the disparity grew to the proportions that Lord Elibank feared, but the Government's information was that quite a remarkable degree of uniformity had been achieved.

National Boards' Expenditure

Mr. Nabarro asked the Chancellor whether he would make a statement of the results achieved in reducing and deferring certain capital expenditure of an inessential character by the nationalized industries, and the sums involved, in accord with the economic and financial policy announced in July.

Mr. Butler said that he could not yet make a statement; the investment programmes were now being reviewed.

North of Scotland Plant

Mr. Nabarro asked the Secretary of State for Scotland whether he would state the aggregate installed capacity of the power establishments of the North of Scotland Hydro-Electric Board at 30th November.

Mr. Stuart said he was informed by the Board that the installed capacity of its generating plant was:—Hydro-electric plant, 479,000 kW; diesel plant, 43,300 kW; steam plant (coal-fired), 103,000 kW; aggregate capacity, 625,300 kW.

Mr. Stuart, answering another question by Mr. Nabarro, said that the North of Scotland Hydro-Electric Board informed him that it had made surveys in the Loch Awe area for both a conventional hydro-electric project with an installed capacity of about 75,000 kW, and a pumped storage project with an installed capacity of about 350,000 kW. The Board had not yet submitted a constructional scheme giving estimates of the cost.

Transport Bill

A Bill which would enable private groups to buy branch railways which are closed down by the British Transport Commission and to operate railbus services with diesel railcars or electric battery vehicles, was presented for its second reading in the House of Commons on Friday by Mr. Archer Baldwin, M.P. for Leominster. The general object of the Bill is to improve all forms of rural transport—road, rail and canal—and one of its most important provisions lays down that the Transport Tribunal may require, when it is proposed to close down a line, that the Commission shall sell, lease or otherwise dispose of the railway to the highest bidder.

For the Government, Mr. Hugh Molson, Parliamentary Secretary, Ministry of Transport, said that the proposals in the Bill were not satisfactory or workable in their present form, and if the Bill got a second reading the Government would want to move various amendments. The Government were not opposed to the principle of selling uneconomic branch lines. When Mr. Baldwin sought to get a division at the end of the debate there were not enough members present to give a decision so the Bill goes to the bottom of the list of Private Members' Bills to be considered later in the session.

Moving the second reading, Mr. Baldwin said that the Transport Commission had been using figures, as anyone could, to prove that branch lines could only be run at a loss, and his Bill would ensure that there was a hearing by an independent transport tribunal before a decision was taken. In the County of Donegal a branch line was closed, but it was converted for a service of diesel railcars; the result was that the mileage was increased by 86 per cent, and the cost reduced by 33 per cent. In the United States an 18½ mile section of line was closed but the inhabitants of one town got together, bought the line and began to work a diesel railcar. Now they were paying 4 per cent on their total outlay and increasing business was being brought back to the railway. That could also be done in this country.

He hoped the B.T.C. would wake up to the fact that it was possible, by using up-to-date methods, to keep in service lines which were uneconomic to run on the present basis. The great thing about light railcars was

that it was possible to get services of increased frequency, at a substantially lower cost. For an illustration, he had chosen a line ten miles long in his own constituency, where the gradient was not more than 1 in 80. Two types of vehicle could be used: the diesel railcar, and the battery electric vehicle, which was probably the better. It was simple to operate and the batteries could be re-charged at the main depot during the night when the cost of doing so was at its lowest. The vehicle he proposed was about 30ft in length, capable of carrying 30 passengers seated and fifteen standing, which was quite sufficient in a rural area. The prototype vehicle would cost £9,000 but if vehicles were ordered in batches of half a dozen the cost would be reduced to between £5,000 and £6,000. The cost of running the railcar on a 10-mile section, covering fuel, maintenance, depreciation, interest charges, labour, and allowing £60 a mile for track maintenance, would come to 15s a journey. It would provide both a passenger and a parcels service. The great advantage was that it was a light vehicle which could be stopped and accelerated easily and quickly.

Mr. Clifford Kenyon said that the provision of transport for the rural areas involved the same problems as in rural electrification, which would cause a tremendous financial loss to the British Electricity Authority. As the chairman of an electricity authority he had learned that this was true. Profit from areas where electricity could be provided at a profit would have to be spread over the country generally before the whole of the land could be electrified. But the B.T.C. would have to consider the closing down of branch lines much more seriously. The diesel engine and the electric train could cut costs considerably.

Mr. Denzil Freeth did not think the fall in maintenance costs, through using railcars, would be as big as some people suggested. The car itself was an expensive item of equipment.

Mr. Hugh Molson, giving the Government's views, said the B.T.C. had been enterprising in seeking new techniques. The multiple unit diesel was proving extremely satisfactory. Figures from the West Cumberland group of services showed that operating costs had been reduced from £150,000 to £80,000 a year despite a 30 per cent increase in the mileage operated. Traffic had increased as a result of the greater attractiveness of the new locomotion and receipts had risen from £45,000 to £70,000 a year.

As for the suggested electric cars propelled by their own batteries, the great trouble with these was the immense weight of the batteries. A single 25-ton vehicle required batteries weighing about 10 tons, with the result that the vehicles cost several times as much as a road bus. There was no information at the Ministry's disposal that suggested that these vehicles could be made or run at the prices suggested by Mr. Baldwin. The North of Scotland Hydro-Electric Board was making current available at a very low rate—¾d per kWh—for an experimental period and British Railways were going to see whether in the North of Scotland it might be possible to provide a useful service in rural areas. He was not very hopeful of this because these vehicles cost about three times as much as a diesel road bus. As for the down-grading of a railway into a light railway, he was advised that this did not appreciably reduce the cost of upkeep. Under the safety requirements, the change would result in no substantial economy in the cost of signalling.

Institute of Fuel Rating Decision

The House of Lords on Monday last allowed an appeal by the Institute of Fuel against a decision of the North West London Valuation Court and the Lands Tribunal (subsequently confirmed by the Court of Appeal). Their Lordships ruled that the Institute conformed to the definition of a scientific society in the Scientific Societies Act, 1843, and consequently was exempted from being assessed or rated in respect of its premises in Devonshire Street, London, W.1.

COMMUNICATIONS SYSTEM FOR ECUADOR

A contract for multi-channel radio telephone/telegraph systems has been placed with Marconi's Wireless Telegraph Co., Ltd., by the Government of Ecuador. This contract, which will bring more than a million dollars to Britain, was obtained in face of keen competition from French, German and American firms.

The order calls for the supply of radio, carrier-telephone, voice-frequency telegraph and teleprinter equipment, as well as complete power plants, towers, aerials and buildings. Marconi's will be responsible for advising the Authority on the new telegraph system and on trunk operations; this will include a manually operated "Telex" service and, possibly, an inter-city dialling service.

The multi-channel radio system will cover a total distance of 265 miles running southwards from the capital city of Quito, through the important rail point of Riobamba to Guayaquil. Altogether there will be twelve stations in the system, many of which will be at a height of 9,000-15,000ft above sea level, for much of the route lies along part of the Andean mountain chain. A final and detailed survey of the proposed route will shortly be begun by Marconi engineers to decide on the most favourable site for the repeater stations.

The system will form the backbone of a communications network eventually covering the entire country. Whilst the installation work will be carried out in its entirety by Marconi's, engineers and technicians from Ecuador are to be trained on all the equipments, so that they can assist in the installation and take over the maintenance of the new system when it comes into operation. The carrier telephone equipment is to be manufactured by the Automatic Telephone & Electric Co., Ltd.; the voice-frequency telegraph equipment by the Telephone Manufacturing Co., Ltd.; the power equipment by J. & H. McLaren, Ltd.; and the teleprinters by Creed & Co., Ltd.

PRICES OF MATERIALS

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM Ingots	ton £171 0s 0d
COPPER, H.C. Electro	ton £397 10s 0d
Fire Refined 99·70%	ton £396 0s 0d
Fire Refined 99·50%	ton £395 0s 0d
COPPER Tubes ..	lb 3s 9½d
Sheet	ton £467 10s 0d
H.C. wire and strip ..	ton £440 5s 0d
LEAD, English ..	ton £112 10s 0d
Foreign	ton £111 0s 0d
MERCURY	flask £90 0s 0d
TIN, block (English) ..	ton £827 10s 0d
ZINC, G.O.B. Foreign	ton £97 15s 0d
Electrolytic	ton —
BRASS Tubes (solid drawn)..	lb 2s 11¾d
Sheet	ton £358 15s 0d
Wire	lb 3s 6¾d
PHOSPHOR BRONZE Wire	lb 5s 3¾d
PLATINUM	oz £32 10s 0d
RUBBER, No. 1 R.S.S. spot	lb 36½d—37d

NEXT WEEK'S EVENTS

Organizers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged

Tuesday, 20th December

EDINBURGH.—Carlton Hotel, North Bridge, 7 p.m. I.E.E. South-East Scotland Sub-Centre. "High-Speed Electronic Analogue Computing Techniques," by Dr. D. M. MacKay.

LIVERPOOL.—9, The Temple, Dale Street, 6 p.m. I.E.S. Liverpool Centre. "Lighting in the Rayon Industry," by G. E. Shepherd. (Joint meeting with the A.S.E.E.)

LONDON.—Lighting Service Bureau, Savoy Hill, 6.30 p.m. Association of Supervising Electrical Engineers. London National Lecture: "The Heat Pump with reference to Domestic Installations," by G. P. Watson.

The Institute, 85, Minories, 5.30 p.m. Institute of Marine Engineers. "Nuclear Power for Commercial Vessels," by K. Maddocks.

PORTSMOUTH.—"Air Balloon," 598, Commercial Road, Mile End, 7.30 p.m. A.S.E.E. Portsmouth Branch. "Electricity in the Aircraft Industry," by W. A. Pile.

Friday, 23rd December

LEICESTER.—The Trocadero. Leicester Electrical Society. Christmas party.

TETTENHALL WOOD.—The Mount Hotel, 7 for 7.30 p.m. Institution of Production Engineers, Midlands Region, Wolverhampton Graduate Section. Dinner-dance.

INDUSTRIAL NEWS

Contracting Industry Wage Claim

The claim of the Electrical Trades Union that to the increase of 3d an hour given as an interim settlement last February there should be a further increase of 1d an hour was heard by the Industrial Disputes Tribunal on 9th December. The reference was a mutual one. The claim was contested by the National Federated Electrical Association on the grounds that the February settlement had taken into account possible increases in the cost of living within the foreseeable future; that wage increases in most other industries were below the E.T.U.-N.F.E.A. February settlement; that wages in the electrical contracting industry compared favourably with wages in related industries; and that production and profits of the industry did not warrant a further increase in wages.

Administrative Training

At a recent meeting of the National Joint Advisory Council for the Electricity Supply Industry it was agreed that a working party should be set up to examine a prepared draft scheme of administrative training under the following terms of reference: "To consider administrative training and to make recommendations to the Education, Training and Efficiency Committee." The working party consists of five Electricity Board representatives and five trade union representatives, with Sir Henry Self as chairman.

Cooker Control Units for Singapore

The City Electricity Department of Singapore has placed an order for 2,000 surface type cooker control units manufactured by D.S. Plugs, Ltd., of Manchester.

Brazilian Steel Manufacture

It is estimated that by 1960 Brazil's annual requirements of primary steel will be 2 million tons and local manufacturers are preparing to meet this demand. The local production of ingots increased from 885,263 tons in 1953 to 1,171,893 tons in 1954 and projects now being carried out will augment this by 1,005,000 tons during the next four years

Conditions are changing in favour of the use of electric reduction furnaces, but firms planning to install them in Rio and Sao Paulo must provide their own generating plant until the five-year electrification programme is completed. In Minas Geraes, which has 24 steel plants in operation, special provision has been made to supply manufacturers with power from the Government's central generating stations. The Jafet group, comprising four companies, is building steelworks at Belo Horizonte and gradually replacing its charcoal blast furnaces by electric furnaces of higher capacity. Mineracao Geral is installing electrically-operated plant to manufacture ferrous alloys and special steels.

The engineers who drew up Siderurgica Paulista's project for steelworks at Piassaguera, near Santso, concluded that at current prices the cost of iron made in electric furnaces could compete with that of iron made in conventional coke furnaces, but the amount of power required would exceed the possibilities of Sao Paulo's public supply. To operate with Bessemer convertors and electric furnaces, or with electric furnaces only, would require 150 MW initially; this would become available on completion of the Caraguatuba hydro-station near Piassaguera. For these reasons Siderurgica Paulista's plant will begin operating with imported coal (which will be gradually replaced by national coal as supplies become adequate) and when future expansion is being considered the question of adopting electric furnaces will be re-opened, provided Sao Paulo's installed capacity has been sufficiently increased.

N.S.W. Railway Electrification

Recently the electrified service to Penrith was opened by the Hon. J. J. Cahill, Premier of New South Wales. This ceremony marked the completion of the second stage of the Sydney to Lithgow main line railway electrification and now provides a suburban service between Penrith at the foot of the Blue Mountains and Sydney. During trial runs with an electric locomotive on this latest section the overhead equipment was satisfactorily tested at a speed of 70 m.p.h., the 20-mile journey between Parramatta and Penrith being completed in 21 minutes in each direction. At the opening ceremony British Insulated Callender's Cables (Australia) Pty., Ltd., the contractors responsible for the design, supply and erection of the 1,500 V d.c. overhead equipment used on this route, were represented by the chairman of the company, Sir T. Malcolm Ritchie.

New York World Trade Fair

A World Trade Fair is to be held in the new Coliseum Building in New York from 14th to 27th April, 1957. The promoters are the Charles Snitow Organization Inc., of New York. The organizers regard the Fair as essentially for displays of foreign products and are rejecting applications for space from United States manufacturers. There will be ten trade sections, the hardware section including home electrical appliances, radio and television equipment and electro-acoustical equipment. Another section will include electronic equipment, scientific instruments, precision tools, small power tools, heating and air-conditioning equipment and supplies, electrical equipment and motors, automotive accessories and parts. It is planned to establish a Free Trade Zone for the Fair whereby products may be brought in for display and exhibited without payment of duty. Applications for space and general inquiries about the Fair should be addressed to the London representative of the Charles Snitow Organization, Mr. A. P. Wales, Dudley House, Southampton Street, Strand, London, W.C.2.

New Zealand Geothermal Project

The United Kingdom Atomic Energy Authority has issued a statement in which it says that towards the end of 1954 an agreement was signed between the New Zealand Government and the Authority whereby a joint company, Geothermal Development, Ltd., was set up with the object of building a plant at Wairakei in the geothermal region of the North Island. The purpose of the plant will be to produce both heavy water and electric power from geothermal steam. The Authority has undertaken to purchase from the company the whole of the heavy water and the State Hydro-Electric Department the whole of the net electric power available. The Government and the Authority are the sole shareholders.

The company is to have a nominal and paid up capital of £30,000, one-third of which is to be provided by the Authority and the rest by the New Zealand Government. The remainder of the capital requirements of the company will be provided by loans. Those for the heavy water plant are to come from the Authority and those for the electric power equipment will be supplied by the New Zealand Government.

Revised estimates have been received concerning the cost of the heavy water scheme. These estimates need examination in consultation with the New Zealand Government. It will not be possible to make a statement for some time.

Future of H. Fisher (Oldham), Ltd.

H. Fisher (Oldham), Ltd., who for the past three years have been in the hands of receivers, have now been purchased by the Hartley Baird Group.

The firm will continue to operate as a self-contained unit within the group, and it is the intention to carry on the development and manufacture of electric washing machines and other electrical appliances. A number of new designs are being developed including the "Creston" all-electric washing machine.

Irish Electrical Imports

Imports of electric washing machines into Ireland for the nine months ended September last totalled 8,726 machines, valued at £238,728, as compared with 7,314 machines (£196,855). Of the total 95 per cent came from Britain. A total of 11,425 vacuum cleaners (£106,022) was imported, as compared with 11,681 (£122,148) in the first nine months of 1954. A slight fall in number but an increase in value of electric filament lamps imported is shown—1,939,805 (£51,091), as compared with 2,084,200 (£46,479).

Threatened Power Station Stoppage

A one-day "token" strike at power stations and depots in the London area on 2nd January was threatened last week by members of the National Union of Firemen, Mechanics and Electrical Workers unless a substantial increase in basic pay was conceded by the Central Electricity Authority.

Plant Engineers' Course

The Incorporated Plant Engineers Education Committee announces that its refresher course for works and plant engineers in London and the Home Counties, which commenced at the Royal Empire Society in November, has surpassed the enrolment records set up by the previous courses in other parts of Britain. Five hundred and fifty engineers have been entered for it, and some hundreds of further applications have had to be declined as all available accommodation is fully committed. The committee has now organized a shortened version of the London refresher course for the benefit of senior works and plant engineers in Hampshire and the adjacent counties. Sponsored by Sir Henry Tizard, G.C.B., D.Sc., F.R.S. (Pro-Chancellor of the University of Southampton), it will consist of twelve weekly lectures from the London course syllabus given by the same lecturers, and will be held at Southampton University on Tuesday evenings commencing on 17th January.

New Plessey Company

A new company has been formed within the Plessey group, to be known as Plessey Research, Ltd. During recent years the group has founded research establishments in various parts of the country on projects ranging from basic research through to component development, and application research of various types. These establishments are in many instances working on secret Government projects, although a high proportion are devoted to commercial research and development. These activities have now reached the point where the board has decided it is necessary to unify and bring together the control of all these units, in order to achieve the maximum long term results. The chairman and managing director of the new company will be Mr. A. G. Clark and the directors will include Messrs. B. G. W. Attwood, E. J. Earnshaw, Michael Clark and G. C. Gaut.

Siemens-Schuckert in Australia

The Melbourne correspondent of the *Financial Times* reports the registration of Siemens-Schuckert Australasia with a nominal capital of £A500,000, of which a third is held by the German Siemens company, a third by a London company and the rest by Mr. J. W. Maddison, Melbourne. It is said that the new company will continue as an agency for the time being but will later develop an assembly business and subsequently manufacture lines not made already in Australia.

Hoover Finnish Company

The Hoover company of Finland, Hoover Oy, was recently inaugurated at Vuorikatu 16, Helsinki. It will control the distribution of Hoover products throughout Finland and in its factory of 1,500 sq metres at Herttoniemi, Helsinki, will manufacture the Hoover cylinder cleaner and the Hoover Mark II washing machine. British-made Hoover products will also continue to be distributed as the import licensing system permits. The managing director of the new company is Mr. V. Havulinna, whose company, Havulinna Oy, has until now distributed Hoover products in Finland. Other Finnish directors are Mr. T. Siimes, deputy managing director, and Mr. A. Roschier Holmberg, while Mr. S. Roberts, managing director of Hoover, Ltd., Great Britain, is also a member of the board.

Goods Transport Guide

Since denationalization, free-enterprise operators have re-established a nation-wide network of long-distance road transport services. Names, addresses and telephone numbers of many hundreds of these operators are contained in the January-June, 1956, "ABC Goods Transport Guide," published by *Motor Transport*. The only publication of its kind in this form, this edition also contains numerous entries covering hauliers who do not operate regular timetable services. Other sections of the Guide give details of "smalls" or parcels services; clearing houses; machinery carriers; bulk liquid carriers; British road services; railway offices; shipping services (coastwise and to the islands); ferry services; warehouse keepers; London public wharfingers; air charter companies; and makers of materials handling equipment. Copies of the Guide (3s 6d including postage) can be obtained to order from newsagents, or direct from Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1.

Union Finances

The total funds of registered trade unions at the end of 1954 amounted to £73·9 million, an increase of £3·2 million over 1953, according to the annual report of the Chief Registrar of Friendly Societies. Membership rose from 8,323,000 to 8,357,000. The largest increase in membership was that of the Amalgamated Engineering Union (16,000), the Electrical Trades Union gaining 4,000 new members. The average subscription was £2 4s (against £1 17s in 1938). Dispute benefit, at £483,000, was the highest recorded since the General Strike in 1926, the amount paid by the E.T.U. (£191,000) being the largest. In some unions the total average expenditure per member exceeded the average contribution; in most cases this was made up by other income, but the E.T.U. found it necessary to draw on its funds, which fell from £724,000 to £441,000.

Sales Management Courses

A series of week-end courses to give practical training in sales management subjects will be held in the New Year by the Incorporated Sales Managers' Association. The first (6th to 9th January) will be held at Oxford, and the others at Berkhamsted on the following dates:—17th to 20th February, 9th to 12th March, and 23rd to 26th March. The fee for each course is £5 5s and applications for registration should be made to the Association at 51, Palace Street, Westminster, London, S.W.1.

Nuclear Equipment for Chile

The "Fortnightly Review" of the Bank of London and South America reports that scientific equipment for nuclear studies, to be carried out at the University of Concepción, Chile, is to be imported from the United Kingdom. Professor A. C. Maddock, of London University and Harwell, is due to arrive in Chile in February to give a course of lectures on the subject.

Aluminium in Shipbuilding

A symposium was held on Wednesday and Thursday of last week on the Use and Welding of Aluminium in Shipbuilding. The meetings were held at the Institution of Civil Engineers and were under the auspices of that body in conjunction with the Institute of Welding, the British Welding Research Association, the British Shipbuilding Research Association, and the Aluminium Development Association. Four sessions dealt

with welding processes, materials and design, applications and economic factors; and the whole series covered very fully recent developments in welding technique and the way in which this knowledge is being continuously applied to the ever more varied use of aluminium in place of conventional materials.

A reception and film show was held by the president and Council of the Aluminium Development Association, in connection with the symposium, on the Wednesday evening.

B.T.H. in Ulster

Speaking in Belfast last week as chairman of the Northern Ireland Development Council, Lord Chandos said that the British Thomson-Houston Co., Ltd. (which is already constructing a large steam turbine works at Larne), was considering the establishment of another new plant in Northern Ireland, capable of employing 2,500 workers.

E.I.B.A. North Metropolitan Branch

The annual general meeting of the North Metropolitan Branch of the Electrical Industries Benevolent Association will be held at Northmet House, Southgate, N.14, on 13th January (3 p.m.). Nominations for officers should be submitted to Mr. T. Yule, hon. secretary, Northmet House, Southgate, London, N.14, not later than 6th January.

Country House Floodlighting

The accompanying picture shows a new floodlighting installation at Chadwick Manor, near Knowle, Warwickshire. Chadwick Manor lies about 1,000 yards from the Birmingham/Warwick main road, standing considerably higher than road level. There are a number of positions on the road where a long distance vista of the Manor is revealed. The main building is lit by tungsten lamps and the roof and certain other features by m.v. lamps. The absence of any competitive lighting in the area has enabled an excellent effect to be obtained with the comparatively small loading of 12 kW. The installation employs fittings made by Rowlands Electrical Accessories, Ltd.

Floodlighting of Chadwick Manor, near Knowle, Warwickshire

British Railways

The British Transport Commission has issued the 1955 edition of "Facts and Figures about the British Railways," which gives in concise form the principal facts and statistics covering the activities of the British Railways. Reference is made to modernization plans for the replacement of steam by diesel and electric traction on a large scale. Statistics show that at the end of 1954 2,608 miles of single track were electrified and the electric train-miles run (coaching and freight) totalled 50·8 million. Electricity consumed for traction amounted to 891,056 kWh. The number of electric locomotives in operation was 71, the number of motor carriages 2,150 and trailers 2,482. Copies of the booklet can be obtained free from the Commission at 222, Marylebone Road, London, N.W.1.

Volk's Railway Contract

In our issue of 18th November it was stated that Brighton Corporation had awarded contracts to three companies for works in connection with Volk's Railway, Brighton. Actually the Council, on 27th October, instructed its Transport Committee, subject to the necessary Government approval, to submit to tender the order for the construction of four new cars for Volk's Electric Railway to a specification and design to be approved by the Council. We regret the error in our report.

Australian World's Fair

The United Kingdom Trade Commissioner in Sydney reports that the Australian World's Fair is to be held at the Sydney Showground from 26th July to 4th August, 1956. Exhibits will be arranged by industries and will include sections for agricultural implements and equipment, domestic electrical appliances, engineering and mining equipment, machine tools, scientific instruments and television equipment. Applications for space, made on the official forms and accompanied by a deposit of 50 per cent of the total cost of the space applied for, must reach the managing director, Australian World's Fair, 234, Clarence Street, Sydney, N.S.W., from whom full particulars can be obtained, not later than 1st March. Contracts must be completed by 30th April.

E.M.I. American Agreement

An agreement between the E.M.I. Group and the Cincinnati Milling Machine Co., U.S.A., provides for the integration of the study and development of electronic machine tool control equipment on the part of these two concerns.

Factory Extensions

Factory additions covering 42,000 sq ft are being made at Bedlington (Northumberland) by North-Eastern Trading Estates, Ltd., on behalf of Welwyn Electrical Laboratories, Ltd. The additions are expected to be completed by next September, and when in full operation the firm's payroll will be increased from about 1,000 to 2,000.

Welding of Heavy Pressure Vessels

Quasi-Arc, Ltd., announce an interesting application of "Unionmelt" welding on pressure vessels with a wall thickness of 7·5in for a test pressure of 27,000 lb/sq in. All the welds passed X-ray inspection. Four hundred passes were required to deposit 265 lb of weld metal in each of these two joints and each pass was visually inspected to make sure that the welding was clean and free from any defects. Welding speeds up to 20in per minute were obtained, which made the job an economical proposition.

Calendar

An excellent view of Badcall Bay, Sutherland, has been chosen by Mavor & Coulson, Ltd., for their 1956 calendar which has bold-figured monthly sheets.

Changes of Name

The Vacuum Oil Co., Ltd., has changed its name to Mobil Oil Co., Ltd.

The title of Sheet Metal Specialities, Ltd., has been changed to Zephair, Ltd.

Trade Announcements

Enfield Cables, Ltd., informs us that the telephone number of its Edinburgh branch is Edinburgh 31403.

The **Wallis Engineering Co.** is now at 399, Warwick Road, Birmingham, 11 (telephone: Acocks Green 4766).

Industry in 1954

Annual Report of H.M. Chief Inspector of Factories

IN the annual report on the work of the Factory Department of the Ministry of Labour and National Service for the year 1954, Sir George Barnett, H.M. Chief Inspector of Factories, predicts that automation will eventually influence the cleanliness of the factory and increase its safety and comfort, because the machine or process would be remote from its human supervisor. Automatic handling also is bound to increase which will in turn eliminate many accidents due to the man-handling of goods and materials. There is also a strong possibility of an increase in shift working, because automation would otherwise be uneconomic. Copies of the report are now available at 8s from H.M. Stationery Office.

Sir George points out that we are only at the beginning of this new development, which is being hailed by visionaries as the second industrial revolution. Whether this is true or not only time will tell but he is satisfied that what is called the " push-button factory " will take a long time to develop. There is no doubt that automation has a considerable future in this country for mass production work, where long lines of the same type of product can be assured, but he does not visualize any drastic overnight changes even in these fields. The importance of these present trends has been noted by many thinking people and the whole subject is receiving serious consideration by those responsible for the future pattern of industry.

During last year the factory population was greater than that recorded in 1953 which was the highest then recorded in peacetime, and the increase in accidents from 181,637 in 1953 to 185,167 in 1954 reflected this increase in the number of persons at risk. In factories only, omitting other places covered by the Factories Act, the rate per 1,000 workers showed a slight decrease. There was a small increase in the rate for men, but there was no decrease in the rates for women and young persons. The report appeals for a real attempt to be made to bring the accident rate for women below the level of 10 per 1,000, about which it has fluctuated since 1951.

Marked activity continued to characterize the electricity supply industry during the year. The capacity of new generating plant brought into commission was nearly twice as much as in any post-war year, but it was still substantially below that originally planned, and many obsolescent generating sets had to be kept in service. Accidents continued to occur due to the use of equipment such as cranes and steel scaffolding in the vicinity of overhead transmission lines. During the year 707 electrical accidents occurred which were reportable under the Factories Act and 88 of these were fatal. This was 37 and 7 respectively fewer than in the previous year. In fact, the total number of accidents is the lowest recorded since 1938, when there were 560 accidents, 30 of which were fatal. During 1954 there were also 113 dangerous occurrences as compared with 104 in the previous year. In addition to the 33 fatal accidents reportable under the Factories Act, a further 89 electrical fatalities in places outside the scope of the Acts came unofficially to the notice of the Department, the total known fatalities due to electricity being 122.

The report shows that a great preponderance of electrical accidents occurs in the l.v. category but this is to be expected since it is on apparatus in this class that most work is done. It is noteworthy however that in the last few years there has been an increase in accidents on apparatus at the higher voltages, and this to some extent at least is due to the increase in accidents arising from contact with overhead lines.

The accidents which occurred with portable apparatus very often associated with the plugs, sockets and flexible cables concerned, accounted for 45·5 per cent of the fatal accidents and (excluding eye flash) 35·1 per cent of the total accidents. It is clear that increased attention to the portable apparatus of an installation is essential if an appreciable reduction is to be made in the number of electrical accidents. The report recommends that the best precaution which can be taken is to reduce the voltage; experience has shown that a voltage of 110 V, or 50 V where distribution conditions permit (the mid-points or neutrals of the necessary transformers being connected to earth) is relatively free from serious accident. Thus the opportunity should be taken whenever possible, and especially in new factories or when extensions are being made, to install a low voltage distribution system. This can be done for a relatively small increase in capital cost and later improvisations are then avoided. Although low voltage or one of the specialist protection systems may be adopted there is still a need for care in the selection of plugs and sockets and in the means of producing reduced voltage.

A portable hand lamp is possibly the only piece of portable equipment used in industry in which the live parts are enclosed or protected by comparatively vulnerable materials. There is, therefore, a very strong case for recommending that these hand lamps should be constructed entirely of insulating materials.

The Loudness of Sound

THE National Physical Laboratory has just completed a new series of experiments to find the relations between the intensity and the loudness of pure sounds. The human ear, being a very complicated organ, does not respond equally to sounds of the same intensity but different pitch. What all instruments measure is intensity, which is related to the energy present, but what is heard is loudness, and to relate the two quantities " Equal-Loudness Relations " are needed. These are obtained from tests on live subjects. Pure sounds are those without overtones like tuning fork notes.

Hearing varies considerably from person to person, and particularly with age. Few elderly people can hear a bat squeak for example, because their ears have lost the higher pitched sounds. So the experiments were carried out with a number of subjects, both men and women, between the ages of 16 and 63.

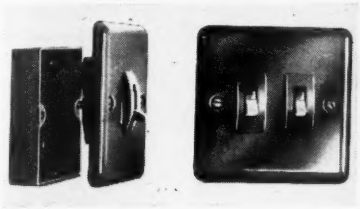
The work, which has taken four years to finish, has involved more determinations than all previous tests of this kind put together—in all over 100,000 separate judgments being made. All the subjects were workers in the N.P.L. They listened to the sounds produced by special loudspeakers in a " quiet room " where it is so still that the subject can hear his own heart beating.

The work is of great value in several different fields of acoustics. For example, nerve specialists trying to discover how people hear want to know what they hear, and engineers working on the reduction of noise (unwanted sound) need reliable information on the hearing of the average listener.

NEW ELECTRICAL EQUIPMENT

Switches

A new flush moulded combined switch and plate unit with 2¾in fixing centres has recently been introduced by NETTLE ACCESSORIES, LTD., Harper Road, Wythenshawe, Manchester, 22. Suitable for use with any box from ⅝in deep having fixing centres conforming to B.S. 1299, it is available in white, cream or ivory and also in brown. The



Nettle Accessories combined switch and plate unit

respective prices per dozen are as follows:—One-gang one-way, £1 15s (brown £1 10s 8d); one-gang two-way, £2 4s 8d (brown £2 1s); and two-gang one- or two-way, £3 12s (brown £3 7s 4d).

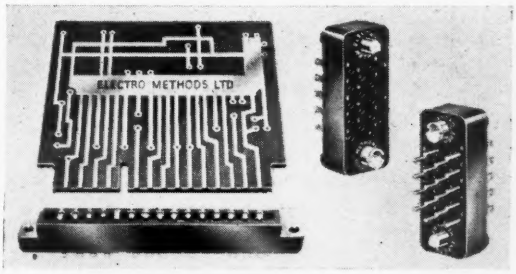
Multi-Pin Plugs and Printed Circuit Connectors

ELECTRO METHODS, LTD., Caxton Way, Stevenage, Herts, announce that they have completed a licensing arrangement with Winchester Electronics, Inc., United States, to manufacture in this country a complete range of high-grade electrical components.

These include miniature and subminiature connectors, self-separating connectors, hermetically sealed connectors, printed circuit connectors and stand-off terminal insulators.

Production will start in early April, 1956, and the items then available will be plugs and receptacles from 7-pin to 50-pin in six ranges, each contact capable of carrying 7·5 A; printed circuit connectors; and stand-off terminal insulators.

Printed circuit receptacle connectors function as an ideal connecting link between printed circuitry and conventional wiring. They allow instant removal and replacement of the "plug-in" card, provide positive identification of individual circuits and simplify attachment of cable lead-off wires. They will be available in 6, 10, 12, 15, 18 and 22 contact position receptacles, the contacts having a 5 A capacity.



Electro Methods printed circuit connector (left) and multi-pin plugs (right)

Electric Sirens

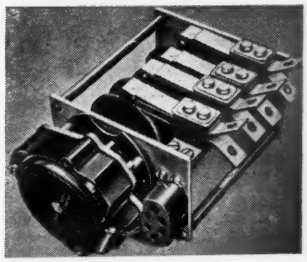
The weather-resisting qualities of the standard range of sirens manufactured by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, have been improved by the sealing of those parts most likely to be penetrated by water. Canopies are still recommended for sirens mounted in the open. The sound ranges vary according to conditions but on average they can be heard from a furlong to a mile away according to rating. They are particularly suitable for fire or burglar alarms and time signals, and the lower rated models are suitable for use on vehicles.

Installation is simple and all types may be fitted in any convenient position. In the open air the upright position is recommended, while in large buildings or factories the siren may be mounted inverted on a ceiling, or horizontally on a pillar or wall. Sound emission is unaffected by the method of mounting. No special control gear is required, the motors being suitable for direct to line starting.

G.E.C. electric siren with improved weather-resisting qualities

Synchronous Timer

A new heavy duty cam operated synchronous timer, type HCST, is being introduced by the ELECTRICAL REMOTE CONTROL CO., LTD., South Road, Templefields, Harlow New Town, Essex. This has been developed from their process timer type CST.



HCST synchronous timer

The new timer has a switching capacity three times larger than the CST and only half the number of contacts and cams are needed for the same switching sequence, thanks to new snap action contact piles. As a result the timers type HCST while having much larger switching capacity have also considerably reduced overall dimensions.

These timers can be used to control a continuously repeating cycle of operations but can also stop after every complete cycle or part of a cycle. Drive is by a synchronous motor geared to a shaft with cams and the switching capacity is 15 A at 240 V a.c.

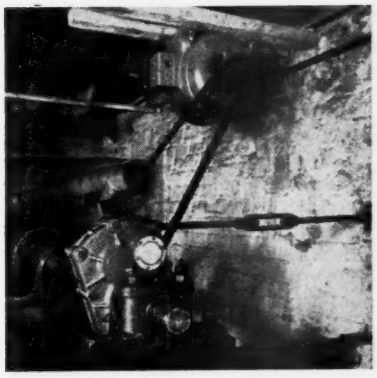
Each timing cam consists of two adjustable halves so that timing of all the intervals within the total timing cycle can be altered by the customer by turning the half cams on the shaft.

Shaft Mounted Speed Reducers

Shaft mounted speed reducers were unknown in this country until the "Torque-Arm" type was introduced just 12 months ago by J. H. FENNER & CO., LTD., Norfleet, Hull. The wide application and considerable success achieved by the first four sizes has led to a demand for higher powered units. Two new sizes, Nos. 5 and 6, have just been introduced, making the "Torque-Arm" available for drives up to 30 h.p.

J. H. Fenner & Co., Ltd., have a brochure available on request covering the full range, including the new sizes.

"Torque-Arm" shaft-mounted speed reducer on line shaft drive



The Next Ten Years

AN ELECTRICAL ENGINEERING FORECAST

AT an inaugural lecture at the Imperial College of Science and Technology on 6th December Professor A. Tustin, M.Sc., M.I.E.E., Professor of Heavy Electrical Engineering, delivered a lecture on "The Next Ten Years of Electrical Engineering." Educationists, he said, must be prophets, and the question to which he would address his remarks was what electrical engineering might be like in the period when the students now in training might be coming forward in industry. In considering this question, it was necessary to take into account the interaction of many events and changes in the whole scheme of things. He proposed to assume as the framework for future industrial development, and so for the future of electrical engineering, a particular combination: first, the achievement of economic stability; second, a progressive easing of present ideological tensions; and third, considerable industrial development in large areas of the world that were at present under-developed.

Economic Stability

The attainment of economic stability was intimately bound up with electrical engineering. Incidentally, one by-product of technological progress in the Soviet Union was that the original race of revolutionaries were beginning to be replaced by men who had developed in the process of building up great industrial and scientific enterprise, and this might make it easier to make contact with them than with the old Bolsheviks. Another point to be borne in mind as a link between the different items he had mentioned was that the technical development of the under-developed areas was closely linked with the problem of economic stabilization. Thus technology was contributing to changing the social and economic setting in which its own further development would take place.

Dealing with the expectation of a rising standard of living and its implications for electrical engineering, Professor Tustin said that there was a general conviction that, given a long period of full employment, a sustained and spectacular rise in our standard of living would be ensured by the nature and speed of scientific and technical progress. But what could not be accepted was the suggestion, so often implied in the popular Press and sometimes also in the technical Press, that progress of this order was more or less guaranteed by the promise of nuclear power, together with the advent of what was referred to as the automatic factory. Admittedly, the existence of nuclear power stations would remove what might otherwise be an obstacle to the possible expansion of production—a shortage of energy—but it had no other relation to production. The idea that much production would be done in push-button factories was a misleading assumption.

To double the present value of goods and services available per head for consumption meant that on the average each member of the working population must produce rather more than twice his previous output, because the pattern of production would require an increasing proportion of capital goods and some proportion would be drawn off as a contribution to the under-developed areas. Only one-third of the working population were employed in manufacturing. If productivity in manufacturing alone were doubled, the standard of living would increase at the most by one-third. For the standard of living to be doubled, the output per worker in manufacturing alone would probably have to be increased about three times.

The principle of automatic control would make great reductions in human labour, but this principle, while important, was of limited application. There was, indeed, often confusion between automatic control and automatic mechanisms in general. It was a natural inference from the achievements in the control of weapons that there must be many industrial operations that were similarly capable of complete mechanization, and this inference was physically correct. It had already appeared that in the field of continuous flow chemical processes such control was indispensable, and he thought that in certain chemical plant this control was likely to result in completely automatic production. Although automatic control had now been established for many years as a well-understood technique outside the chemical industry and found a certain wide use in measurement and in a variety of particular applications, it was perhaps a little disappointing to find that relatively few applications other than those in the chemical industry had yet become established that were comparable in their impact to that made by these principles on weapons of war.

One reason for this was that economic limitations applied to industry that did not apply to military applications. Another reason was that comparatively few industrial operations on which human operators were engaged belonged to this class of regulating or controlling operations. Automatic control, therefore, in the sense of its wartime achievements, had important but limited industrial possibilities.

The developments that were usually cited as indicating the coming of automatic factories were not control systems in this sense at all; they were rather developments of the familiar class of automatic mechanisms such as, say, the capstan lathe or the automatic record changer on a gramophone. The techniques used were an amalgam of mechanical and electrical engineering. The kind of engineer required for this kind of work was a good all-round man and not a specialist in automatic control.

Computing Devices

The automatic digital computer was a new achievement in high-speed counting which was obtainable and which could reach rates of a million a second. Associated with the basic operation of counting were many ingenious devices for storing, combining and recording the counts, and the important basic principle of automatic programming, by which was meant that a sequence of operations or numbers could be carried out without further human intervention and at high speed. The significance of these devices for the industrial future was at present the subject of much speculation and some genuine investigation and interesting experiment. They opened up the possibility of mechanizing certain classes of operations which were now carried out by clerical labour.

Apart from these general purpose large-scale computers, there were many special purposes which could be served by the small machines, for which he thought there was a great scope. Another important class of computing device was the analogue computer, and as an illustration of the use of this device Professor Tustin explained the manner

in which an electrical engineer with an analogue computer could assist economists by explaining an economic prediction. In this field electrical engineering was likely to make an important contribution.

Dealing with the contribution which these developments which he had reviewed might make to productivity, Professor Tustin said that it was obvious that if the desired increase in productivity was to be achieved during the next decade or two, it must be largely by the replacement of human operators by automatic mechanisms. There was a twofold possibility, not only of reducing the number of operators but of speeding up the process when the limitations set by the human factor had been eliminated. But physical possibilities were not necessarily economic possibilities. One could see ways in which almost anything might be made with less and less human labour by the provision of an elaborate apparatus, but one was concerned not only with the labour involved in the production itself but the labour involved in making and maintaining the apparatus. The general inference was that the kind of mechanization referred to as automation was applicable only to articles required in large numbers all the year round for many years.

It was evident that hopes of a much higher standard of living could not be justified by this single group of innovations alone; they might be justified when the prospects of increased mechanization were taken with other large advances, such as the development of new metals, the development of a new outlook in management and the development of a functional structure in industry.

In regard to the expansion of the electrical industry, the view of the future which had been suggested implied that the electrical industry would expand in much greater proportion than manufacturing industry in general: first, because the increase in productivity would be obtained by means that implied a greater consumption of electrical power per unit of average production; and secondly, because the increase in consumer incomes implied an increase in the requirement for electrical goods. It was important in looking ahead to get some idea of the magnitude of those additional factors.

There were some fields in which electrical power consumption was involved in which great developments were planned in the next ten or fifteen years, such as the electrification of British Railways. Moreover, when one thought of multiplying the capacity of the power stations by a factor of five or six, an increase to 80,000 or 90,000 MW, this implied at the same time the production and installation of electric motors of the total of some hundreds of millions of h.p. in industry and transport.

Turning to electronics, which was the lighter side of electrical engineering, an interesting question was when the further stimulus would be given by colour television, which was now in its final experimental stages. This expansion would come in time, because certainly with the rising standard of living a large market would arise, and he was sure that there would be important technical progress in this field.

Taking the position of development as a whole, there seemed to be a sufficient basis for an expectation of future expansion at a rate at least as high as in the heavy electrical engineering field.

A wide field for development would be found in innovations arising from the physics of materials. Every new electrical or magnetic property of materials that was observed had a chance of finding some application. It was the intention to develop this field of research in the Department of Electrical Engineering at the Imperial College, and a particular field in which the Department was making unique progress was ultrasonics. In general, it could be said that the possibilities were so varied and numerous that the fountains of innovation were unlikely to run dry.

Professor Tustin concluded by saying that the implication of this view of the future for higher technical education was that one must all the time be vividly aware of how progress depended on immense and sustained activity in the creation of new knowledge, new methods and devices, and new organizations.

Industrial Radiology

APPLICATIONS of the X-ray image-intensifier tube in industrial fluoroscopy and radiology were dealt with in a paper presented by Dr. A. Nemet and Mr. W. F. Cox (Philips Balham Works) on 15th December before the Institution of Electrical Engineers' Utilization Section. The three factors governing perceptibility of detail—brightness, contrast and blurring—were treated separately, but their partial overall effects were assessed together by means of a D.I.N. penetrameter, which needed wires of different diameters, in preference to one of the step-wedge type. Results of measurements relating to steel and aluminium at from 30 to 200 kV were given.

In fluoroscopy the blurring of the image-intensifier was stated to be about half that of the normal fluorescent screen and could be reduced to one-third by using a 0·3 mm focus and magnification of two. Contrast was increased by using voltages lower than in normal radiography with greater visual acuity and little or no dark adaptation. Sensitivity for aluminium was 1 to 2 per cent and for steel 3 to 4 per cent with an increase in thickness penetrated for a given voltage, thus reducing the size of the generator. Problems could probably be solved which could not previously be dealt with either by fluoroscopy, owing to poor resolution, or by radiography, for economic reasons.

In radiology both contrast and blurring should be comparable with normal radiology. The chief gain was in the size of the Microfile film, which would cost three to twelve times less than the normal film corresponding to image-intensifier magnifications of two to one. The method would be best applied to production checking of small articles, since the size of the screen would limit that of the specimen radiographed at one exposure. Owing to the limited density range (0 to 1·5) in projection, the thickness covered in an image-intensifier was less than in a normal radiograph. With a Microfile film, normal radiographic voltages could be halved with considerable saving in cost of the X-ray generator.

Useful Electricity

In a Friday evening discourse on 9th December at the Royal Institution, Sir Lawrence Bragg (Director, Davy Faraday Research Laboratory) took as his subject the discovery of useful electricity. He showed that Galvani's inquiry into the causes of the twitching of frogs' legs led to Volta's first electric battery, to the discovery of the magnetic and chemical effects of currents, to electric light and to Faraday's demonstration of the production of an electric current by mechanical power with its immeasurable influence on modern science and technology. Early experiments were reproduced.

Rolling-Mill Instrumentation

B.I.S.R.A. Installation at Sheffield

To facilitate research into cold rolling at strip speeds up to 2,000ft/min, a 14in four-high reversible rolling mill has recently been installed in the Sheffield laboratories of the British Iron and Steel Research Association. The scheme of instrumentation developed was described by Messrs. S. S. Carlisle and G. W. Alderton (B.I.S.R.A.) in a paper presented on 6th December before the Measurement and Control Section of the Institution of Electrical Engineers.

The particulars given showed that roll force on each side of the mill, front and back tensions and strip gauge were continuously indicated on high-speed servo-operated photometric dials. Supply voltage to measuring instruments and transducers was at 400 c/s and a rational system of electronic units enabled identical amplifiers to be used for all channels. The B.I.S.R.A. normal gauge-setting equipment on the main control desk included automatic zero setting of a deviation indicator and a Magslip feed of mill-screw setting data received from the screw top. It provided for experiments with various systems of automatic gauge control. On-and-off control of the screw-down motors to gauge deviation had been obtained within $\pm 0{\cdot}0005$in. Means of switching to measured automatic tension control were provided as an alternative to the present method of controlling the coiler-motor current with correction for radius of build up. The ultimate performance of the system would depend particularly on roll eccentricity.

DISCUSSION

Opening the discussion Sir George Nelson (President) said he had tried to impress the necessity for control on users, but they were not always prepared to pay adequately for its advantages. He was a great believer in full employment as a means of getting the best out of people, but extra output could not be obtained by putting in more men. The men were not there to put in. The extra output needed for the national economy must therefore be obtained by providing instrumentation to enable men to make better use of their brains and physical power.

Mr. W. Spence (British Thomson-Houston Co., Rugby) considered the authors very bold in proposing the use of such a plethora of electronic equipment. While such equipment was obviously essential in the steel industry, complete reliability was regarded as the first requirement, which was no doubt the main reason for the attitude of the steel industry towards magnetic amplifiers. He hoped no one would insist on any one type of amplifier. All had their advantages and disadvantages and the best control system would result if the engineer designing it had a free hand.

Mr. W. N. Jenkins (McLellan & Partners) agreed that the instrumentation described was a model for industrial mills of the same class and could with advantage be applied to other types of mills. He thought that the radius-correcting potentiometer would cause difficulties to production mills and would be liable to damage by cobbles.

Mr. J. B. C. Robinson (Imperial Chemical Industries) referred to the installation of electronic equipment, apparently ruthlessly, and sometimes not too well engineered. Neither the makers nor even the designers were responsible, but the maintenance staff who were suddenly asked to get the main rolling mill in action when it had gone off. He recommended alternative methods of control so that the mill could operate, even with reduced efficiency, while faults were corrected.

Mr. J. F. Coales (University of Cambridge) believed there was a tremendous future for on-off controls which saved the motor from running continuously for errors of no importance, if they had a "dead zone." The life of electronic valves could be very great and experience showed that with proper precautions and proper maintenance schedules there need be no catastrophic failure. He was assured that junction transistors now available fulfilled all the roles required of them in this type of control equipment.

Dr. Denis Taylor (A.E.R.E., Harwell) emphasized that thermionic valve circuits could be extremely reliable if properly designed with the right components. A control system for nuclear reactors was designed some years ago without thermionic valves, but was not used because the system with valves had operated so satisfactorily.

Dr. G. Syke (Baldwin Instruments) thought users and the instrument-making industry had perhaps taken reliability too lightheartedly. This position had greatly improved, thanks to sad experience and the educational work of the previous speaker and his establishment. Perhaps the major failures in rolling mill instruments were to be found in elements directly associated with the mill in the purely mechanical, thermal and other working conditions; they were affected by dust and dirt and bashed about by ingots. The electronic equipment, on the other hand, was tucked away in the control room. Elements built into the mill might be a weak point in the gauge-control system.

Mr. T. W. Hood (Robertson & Co., Bedford) mentioned a growing demand for a simple, reliable, workable system of automatic gauge control which did not cost too much. Experience suggested that while such a device might be valuable in rolling accurate strip and might in general be reliable, the smaller firms who could not employ electronic experts fought shy of it.

Mr. J. I. Bernard (Electrical Development Association) referred to the satisfactory experience of larger firms using electronic control and having staffs trained in its maintenance. Doubts arose almost entirely with people who had had no experience of it. It must be well engineered. The increased reliability and precision that came from the improved magnification and accuracy of such systems of control most certainly helped to increase productivity.

Lightning Flashes

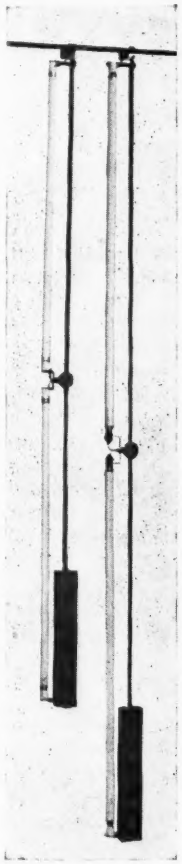
A FRIDAY evening discourse at the Royal Institution was given on 25th November by Dr. B. F. J. Schonland (Deputy Director, Atomic Energy Research Establishment), who took as his subject lightning and the long electric spark. The lightning flash to ground, he said, involved four quite different electrical streamers, which travelled between cloud base and ground—three down and one up. All four processes could occur in the long electric spark, and the establishment of their mechanisms was of importance in the study of the discharge of electricity through gases and might have practical value in leading to an understanding of long-spark breakdown.

SMITHFIELD SHOW

Electricity Well Represented

THE important part played by electricity in all forms of farming was again manifest at the Smithfield and Agricultural Machinery Show held last week at Earls Court, London, where many of the 378 trade stands contained some item of electrical interest.

The use of electricity for crop conservation and economic production of protein winter feed was the principal theme of the British Electrical Development Association's stand, the central portion of which contained a multi-purpose crop dryer. Space was also devoted to a selection of in-silo and platform grain drying equipment, as well as to materials for ventilated floor construction for in-silo installations. Enlarged photographs explained the use of electricity for barn hay drying and visitors were able to see and handle samples of the finished products from this year's crops. Of special interest was the equipment for the cold-blow method of drying. Electrical appliances for the determination of the moisture content of grain were shown and demonstrated while electrical methods of grain handling and processing were explained by further photographs, models and display matter.



G.E.C. fluorescent lighting fittings for seed potato chitting houses

Crop drying equipment was also shown by the General Electric Co., Ltd. A "Transverco" platform grain drying plant was on view. This equipment employs a 13 kW duct air heater and a Woods of Colchester 4 b.h.p. "Aerofoil" fan, and has a self-contained control panel for all switches and starting gear. The average output of dried grass is about 1 to 1½ tons a week and grain can be dried at the rate of 2 to 3 tons per 24-hour day. The G.E.C. also exhibited, for the first time, a fluorescent lighting fitting specially developed for use in seed potato chitting houses. In this two fluorescent tubes are mounted end to end and hung vertically from overhead conduit between stacks of trays containing potatoes. The control gear is fixed to the bottom of the fitting and the whole assembly can easily be moved along between rows of trays as required. The light emitted by the tubes encourages the growth of short, sturdy shoots suitable for planting. Two lengths of fitting are available, one with two 5ft 80 W tubes and the other with two 4ft 40 W tubes.

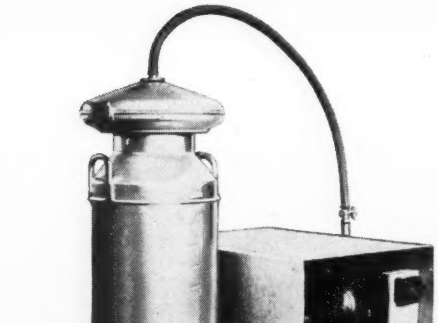
General view of the E.D.A. stand at the Smithfield Show

A fan and heater unit for a silo grain dryer and a platform grain drying unit with heater and propeller fan were also shown, together with equipment for the rearing of piglets, chickens, calves and other livestock, including a dull emitter heater with an unbreakable sheathed wire element. Dairy equipment included a thermostatically controlled water heater and a water storage steam raiser capable of providing ample steam for sterilizing recorder milking plant as well as hot water by steam injection. This equipment is available with loadings of 3, 6 or 9 kW.

Amongst a wide range of plant and equipment displayed on the British Thomson-Houston Co.'s stand were two new items of particular interest. One of these was a 1½ h.p. motor specially developed for agricultural use. It is a single-phase capacitor-start machine having a frame of the same size as the larger f.h.p. machines made by the company but the use of improved materials and manufacturing techniques is claimed to have increased the rating by 50 per cent. The motor can be used for driving milking machines, elevators, etc.; the starting capacitor has been made an integral part of the machine to facilitate installation.

Also demonstrated was a new infra-red heating unit, a single unit of which is adequate for rearing a litter of piglets from birth to 6 or 8 weeks, or for brooding up to 100 day-old chicks until they are 8 weeks old. The "Stavolt" close voltage regulated alternator for small engine-driven generating plants on farms remote from public supply was also shown as a working exhibit coupled to an Armstrong-Siddeley diesel engine.

Price reductions in farm lighting plant, pumping equipment and small general service vaporizing oil engines were announced by R. A. Lister & Co., Ltd., on the eve of the opening of the show. On view was the company's 2½ kW "Start-O-Matic" generating set and its domestic electric pump. Generating sets of 1 kW and 2 kW capacity were also shown by Wolseley Engineering, Ltd., whose display included electric pumps and a wide range of electric fencers and accessories. Arthur Lyon & Co. (Engineers), Ltd., showed a full range of their "Alcon" self-priming centrifugal agricultural pumps, including a new 1½in model which has an output of 4,000 gal/hr. A representative selection of diesel fuel injection equipment and electrical equipment for agricultural tractors and stationary and portable engines was to be seen on the stand of C.A.V., Ltd. Batteries shown included the new thin plate lead acid battery, incorporating patent porous rubber



Purlac one-churn milk cooler

separators with glass wool pads against each positive plate.

Refrigeration equipment was well represented. A full range of "Prestcold" models included two cold rooms, each of 150 cu ft capacity, one of the extendable type operated by a "Prestcold" hermetically sealed unit, and the other fitted with a large display window and incorporating the new hot gas de-frosting system. The company's new SC.131 service cabinet is fitted with hanging rails suitable for the meat trade and it also incorporates a frozen food locker. Frigidaire refrigeration equipment included a comprehensive selection of everything for the meat trade including large chill rooms, service cabinets, frozen food storage and display cabinets, etc. Hussmann British Refrigeration displayed various models of equipment designed for fresh and cooked meats and frozen food cabinets.

Purlac Equipment, Ltd., specialists in milk cooling equipment, have converted one of their trays, 3ft long by 2ft wide, into a small milk cooler which is capable of cooling from 30 to 35 gal of milk a day. The machine incorporates a sealed refrigerating unit and accommodates one churn which can be cooled in 10 min.

An improved model of the No. 32 "Swallow" electric mincer was shown by Swift & Swallow, Ltd. This incorporates a 1 h.p. motor and the switchgear is placed at the rear of the machine in a waterproof panel. Designed for the smaller farmer and poultry keeper, the new "Mini-Wizard" 1½ h.p. automatic hammer mill was shown for the first time by E. H. Bentall & Co., Ltd. William Cook, manufacturers of a wide range of conveyors and stackers, now provide their sack lifters with a ½ h.p. electric motor.

A number of electric fencing units were to be seen. Newcomers to this field are Adams & Benson, Ltd., who displayed their new "AB" electric fencer designed to operate from a 6 V accumulator or 7·5 V dry battery. Also to be seen on this stand was the new "Blundell" wire joiner for use in fence erection; with this it is no longer necessary to replace the whole length of a broken wire—a short piece can be spliced in. Among new Black & Decker tools were a 7in heavy-duty sander grinder and a 6in portable grinder which incorporates a new design of motor. The Tarpen Engineering Co. showed a new chain saw attachment for fitting to their "Tarpentiller" rotary hoe.

Among the latest improvements incorporated in a mobile butcher's shop shown by Smith's Delivery Vehicles, Ltd., are an outside sliding door and larger windows. Other fittings include a "Vent-Axia" extractor fan and an insulated cold storage cabinet.

NATIONAL POULTRY SHOW

ORGANIZED jointly by the *Poultry World* and *Farmer and Stock-Breeder*, the 10th National Poultry Show held at Olympia, London, last week provided ample evidence of the many applications to which electricity can be put to help reduce costs in the poultry industry by the latest production methods.

The important part played by electricity on the poultry farm was well demonstrated on the stand of the British Electrical Development Association whose exhibits included electrically operated incubators, poultry plucking machines, infra-red heaters, tier and hover brooders, and automatic lighting control equipment for increased winter egg production. Also shown was automatic equipment to give instantaneous warning by means of a bell alarm of any interruption in the power supply. The bell can be situated anywhere.

As in previous years, the "Chicken in the Kitchen" section attracted a great deal of attention. It was opened by Lady Turner, wife of Sir James Turner, president of the National Farmers' Union. In the all-electric kitchen, organized by E.D.A., cookery demonstrations were given by Marguerite Patten, the B.B.C. cookery expert. Use was made of an infra-red grill, and other electrical appliances included a controlled heat electric frying pan, automatic time controlled cookers and deep freezers.

Judging by the number of infra-red heating units that were to be seen this type of appliance is growing in popularity with the poultry keeper. Curfew Appliances, Cope & Cope, Ltd., the Visi-Chick Brooder Co., and Western Incubators, Ltd., all had large displays, the last-mentioned company showing its new 3B radiant beam boiler brooder. A newcomer to this field is Commercial & Domestic Heating, Ltd., on whose stand there was a wide range of heating units including infra-red pig and poultry brooders in both "junior" and "senior" sizes.

W.E.M. Products, Ltd., exhibited an automatic poultry feeder claimed to operate on an entirely novel principle. Basically, it consists of a hopper, large enough to accommodate 3 cwt of poultry food, which supplies a feeding trough. This trough, vibrated by a ⅙ h.p. electric motor, passes the food to a balanced container which, when full, operates a switch which stops the motor. When the food has been consumed the motor is automatically restarted. Thus a constant supply of fresh food is always available to the birds.

Detecting faulty eggs is simplified with the egg tester seen on the Janna Co.'s stand. In the testing cabinet the eggs are not handled individually but can be tested thirty at a time in papier maché trays. The Miller brooders have been increased in size and two of their former paraffin heated 100 and 150 chick brooders can now be obtained with "Sunflex" electric heaters; the respective loadings are 100 and 120 W. The "Stillweigh" egg grading machine (Cope & Cope) is now available with an automatic stamping device and alternative models can be supplied for grading in four or six categories.

Courses for Electrical Technicians

A CONFERENCE on "Courses for Electrical Technicians" was held recently at the Institution of Electrical Engineers, with Sir George H. Nelson, Bt., President, I.E.E., in the chair. Nearly two hundred and fifty persons were present, including a large number of principals of technical colleges and education and training officers in industry. The Ministry of Education, Regional Advisory Councils for Further Education, associations concerned with technicians, and the Services were also represented. This was the third conference to be convened by the Council of the I.E.E. since it first invited interested organizations in 1953 to consider the widespread need for more courses to meet the requirements of the large number of electrical technicians for whom the existing craft courses and National Certificate courses were not suitable. After the second conference in July, 1954, an interim report was published by the Council, and the City and Guilds of London Institute then undertook to develop a scheme of courses on the lines recommended in this report. The City and Guilds Institute has now drawn up regulations and syllabuses for the conduct of examinations for electrical technicians, and the main object of the recent conference was to help to publicize the scheme and to provide an opportunity for discussing its implementation. A short report drawing attention to the new scheme and commenting on some of the proposals has been published by the Council of the Institution.

Scope of the Courses

The new scheme will offer technicians' certificates for technicians engaged in the design, manufacture, testing, erection, operation and maintenance of electrical plant and equipment in a number of branches of electrical engineering. At the outset the courses will cover plant and machinery, power generation and supply, and industrial electronics. Additional courses will be developed to meet other needs of the electrical engineering industry, and in response to a request by the Council of the Institution early attention will be given to a course for electrical drawing-office technicians.

The new course is of four years' duration and is intended for students attending part-time day classes for one day a week or for three evenings a week. The subjects of the first two years include electrical engineering principles, engineering materials and drawing, practical mathematics and technical reports. In the third and fourth years the course caters for the special requirements of technicians who will be employed on power equipment or in industrial electronics. A feature of the fourth year is the provision made for colleges to develop courses and examinations in a special technique according to local requirements. Endorsement courses in special techniques at a more advanced level may be provided for those who qualify for the technician's certificate at the end of the fourth year. A full technological certificate will be awarded to candidates who hold an electrical technician's certificate and subsequently obtain passes in at least two endorsement subjects. The electrical technicians' certificates will be endorsed by the Institution of Electrical Engineers, the City and Guilds of London Institute and, when appropriate, an association concerned with technicians. The full technological certificate will, in addition, be endorsed by the Ministry of Education. Full particulars of the courses and examinations are published by the City and Guilds Institute in Pamphlet No. 57 entitled "Electrical Technicians' Courses."

The subject of the conference was introduced by a number of invited speakers. Outlining the scheme, Mr. M. W. Humphrey Davies, chairman of the City and Guilds of London Institute committee responsible for the syllabus, indicated that the new courses placed less emphasis on the mathematical and more on the practical aspects of electrical engineering and should appeal to the student who found the National Certificate course too difficult. This was also the theme of Mr. C. Grad, education manager of the British Thomson-Houston Co., Ltd., who spoke on behalf of industry and expressed the ready support which industry would give to the courses. Dr. J. E. Richardson, principal of the Northampton Polytechnic, and Dr. J. S. Tait, principal of the Woolwich Polytechnic, dealt with the relationship of the new course to existing part-time courses and the problems of organization in technical colleges. They pointed out that the new courses would enable students to be guided more effectively in relation to their future work, and while it was acknowledged that there would be some problems of organization in colleges they felt that these should not be insurmountable. They expected to see a number of colleges offering the new courses in September, 1956. Dr. Willis Jackson, director of research and education, Metropolitan-Vickers Electrical Co., Ltd., spoke as the chairman of the committee which had prepared the interim and final reports of the Council. He underlined the points made by other speakers and further mentioned that national certificate courses would remain as a route—though an arduous one—to professional status, while the higher national certificate in electrical engineering, in its own right, would continue as an appropriate qualification for many high-grade electrical technicians.

The discussions during the conference indicated warm support for the new courses from both industry and the technical colleges. Mr. F. Bray, C.B., Under-Secretary of the Ministry of Education, said that the courses were welcomed by the Ministry of Education and he felt that technical colleges would be able to overcome the difficulties which might arise in implementing the scheme.

E.R.A. Reports

IT is expected that the use of electrical conduit in wrought aluminium alloy, and fittings in wrought or cast aluminium alloys and zinc alloys, will increase and some tests have therefore been undertaken on the maintenance of electrical continuity of screwed joints between the various metals and between these metals and steel. In addition to the investigation carried out at the E.R.A. Laboratories, tests have been undertaken independently in the Department of Development and Research of Tube Investments, Ltd. The results of all this work are recorded in report ref. V/T119, "Performance of Joints in Steel and Non-Ferrous Conduits and Fittings," by L. Gosland, B.Sc.(Eng.), M.I.E.E. (price 18s).

Report ref. Z/T96, "Investigation of Deterioration of Moulded Carbon Resistors: Second Report," by J. J. Walsh and H. F. Church (price 12s 6d) is a continuation and expansion of an earlier report, ref. Z/T92, the resistors investigated being from two manufacturers. The investigation covered (*a*) a general examination of resistors of both makes, including the measurement of temperature and voltage coefficient and the study of humidity effects and noise, and (*b*) life tests. The life tests show that long life is dependent upon thorough wax impregnation, and that the physical and chemical stability of the wax used is of great importance. Drying out under load may cause initial changes in some resistors.

Calculations have been made to assess the possibility that frequent failures in steel earth wires on a 33 kV steel tower overhead line system were caused by overheating of the earth wire due to excessive current in the spans adjacent to an earth fault. Calculations were made of the currents in the earth wire for a typical line with various positions of the fault, and of the consequent temperature rises. Consideration was also given to the maximum permissible temperature of the earth wire during infrequent short circuits. A full account of the work is contained in report ref. O/T15, "Failures of Earth Wires on a 33 kV Overhead Line System," by F. Buseman, Dr.-Ing. (price 6s).

Domestic Electrical Equipment

Washing Machines

THERE is probably no other branch of household activities that provides as many opportunities for the use of electrical labour-saving devices as the home laundry, and among these the washing machine undoubtedly attracts the attention of the housewife most.

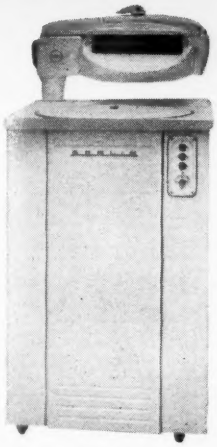
The fitting of a heater is now generally accepted as being standard for most makes of washing machines and several new washers which have appeared on the market since our last survey now incorporate this feature. Included among these are the Hoover Mark II, two additions to the British Vacuum Cleaner and Engineering Co.'s " Goblin " range—models W.130 and W.140, and the English Electric 4005 announced only a few weeks ago.

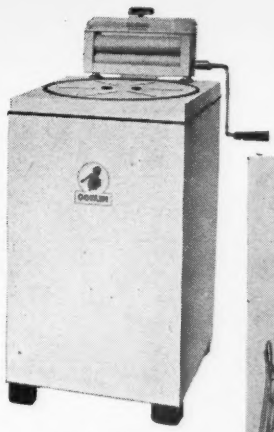
The cabinet styled machine, with its useful table-top working surface, lends itself to the formation of the now popular kitchen units and it is no doubt for this reason that fewer round types are now available. White or cream appear to be the predominant colours and for easier manœuvring castors are fitted to the great majority of models.

In addition to a powered wringer several larger machines have suitable attachments for enabling a rotary ironer to be used. The average dry-weight clothes capacity varies between 6 and 9 lb while smaller machines accommodate between 3 and 5 lb.

With few exceptions prices remain much the same as at this time last year apart from the recent purchase tax increases.

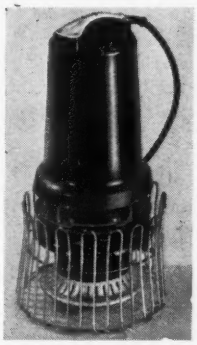
Manufacturer	Name or Model	Type	Size (H.W. & D. in inches)	Tub Capacity (Dry Clothes)	Loading if heated	Method of Operation	Type of Wringer	Pump
ADA (HALIFAX), LTD., Westmount Works, Halifax, Yorks.	Mark I	Cabinet	36×22×22	8½ lb	2¾ kW	Rotary agitator	Power	Yes
	Mark II	Cabinet	30½×22×22	8½ lb	2¾ kW	Rotary agitator	Power	Yes
	Mark IV. " Coronation " Standard	Cabinet	30×18×18	4½ lb	2¾ kW	Rotary agitator	Power	Yes
	Mark V " Coronation " De-Luxe	Cabinet	30×18×18	4½ lb	2¾ kW	Rotary agitator	Power	Yes
BENDIX HOME APPLIANCES, LTD., Albion Works, Kingsbury Road, Birmingham, 24.	" D "	Cabinet	36×26×22	9 lb	—	Tumble action	Spin dry	Yes
BRITISH VACUUM CLEANER & ENGINEERING CO., LTD., Goblin Works, Leatherhead, Surrey.	" Goblin " W.114	Cabinet	30⅜×18×18	4 lb	—	Oscillating agitator	Hand	No
	" Goblin " W.130	Cabinet	31⅜×18½×19	4/6 lb	2½ kW	Oscillating agitator	Hand	Yes
	" Goblin " W.140	Cabinet	34½×22½×22⅝	8/10 lb	2½ kW	Special rubber agitator	Power	Yes
BURCO, LTD., Rose Grove, Burnley, Lancs.	122	Cabinet	37¾×19×21	5½ lb	2½ kW	Agitator	Hand	No
	10 P	Cabinet	35¾×23×25	9 lb	2 kW	Agitator	Power	Yes
CAREFREE DOMESTIC APPLIANCES, LTD., 20-21, Broad Street Avenue, London, E.C.2.	" Carefree "	Sink conversion unit	15×8 diameter	3 lb	No	Impeller	No	No
CLEGG & COUPE, LTD., Molesworth Street, Rochdale, Lancs.	" Prefect " Princess	Cabinet	41×19×19	5½ lb	1·9 kW	Four-bladed agitator	Power	No
	" Prefect " De-Luxe	Round	39×18 diameter	5½ lb	1·9 kW	Four-bladed agitator	Power	No
CO-OPERATIVE WHOLESALE SOCIETY, LTD., National Works, Hall Street, Dudley, Worcs.	" Dudley " 7501	Round	46×25×27	6 lb	—	Central reversing gyrator	Power	No
" COTTO " PRODUCTS, LTD., Enterprise Works, Scunthorpe, Lincs.	" Cotto "	Cabinet	30×18×16	4/6 lb	—	Impeller	Power	No

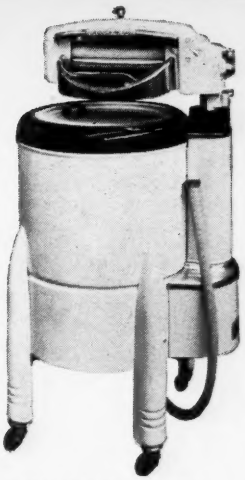




B.V.C. "Goblin" models W.140 (left) and W.114

Below: Carefree sink conversion unit

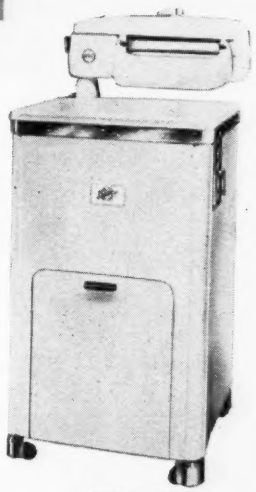




C.W.S. "Dudley" washer

Bendix automatic home washer

Exterior Finish	Tub Finish	Price (excl. tax)	Purchase Tax	Pump
Cream or white enamel	Vitreous enamel	£53 10 0 £48 10 0 (non-heated)	£25 0 9 £22 14 0 (non-heated)	Yes
Cream or white enamel	Vitreous enamel	£51 0 0 £46 0 0 (non-heated)	£23 17 5 £21 10 7 (non-heated)	Yes
Cream or white enamel	Vitreous enamel	£39 10 0 £35 0 0 (non-heated)	£18 9 9 £16 7 7 (non-heated)	Yes
Cream or white enamel	Vitreous enamel	£44 0 0 £39 10 0 (non-heated)	£20 11 10 £18 9 9 (non-heated)	Yes
Vitreous porcelain enamel	Vitreous porcelain enamel	£75 0 0	£34 0 1	Yes
White enamel	Vitreous enamel	£28 7 0 £22 12 6 (less wringer)	£11 3 7 £9 18 6 (less wringer)	No
White enamel	Vitreous enamel	£38 17 0	£15 15 10	Yes
White enamel, vitreous top	Vitreous enamel	£58 10 0 £52 10 0 (non-heated)	£25 13 4 £23 0 8 (non-heated)	Yes
White or cream	Anodized aluminium	£38 0 0 £34 0 0 (non-heated)	£16 12 3 £14 14 10 (non-heated)	No
White or cream	Vitreous enamel	£63 0 0 £58 10 0 (non-heated)	£29 9 8 £27 7 7 (non-heated)	Yes
Maroon and black	—	£12 6 0	£5 8 0	No
Vitreous and stoved enamel	Aluminium	£47 7 6 £42 0 0 (non-heated)	£22 3 5 £19 13 2 (non-heated)	No
Stoved enamel	Aluminium	£45 15 0 £37 15 3 (non-heated)	£21 8 3 £17 13 6 (non-heated)	No
Vitreous enamel	Vitreous enamel	£41 5 0 (a.c.) £45 18 9 (d.c.)	£19 16 0 (a.c.) £22 1 0 (d.c.)	No
Cream stoved enamel	Aluminium	£36 12 11	£15 17 6	No



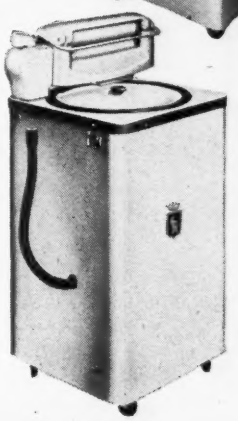
Left: Burco model 10P heated washing machine

Below: Burco 122 boiler/washer

Left: "Cotto" Products washing machine

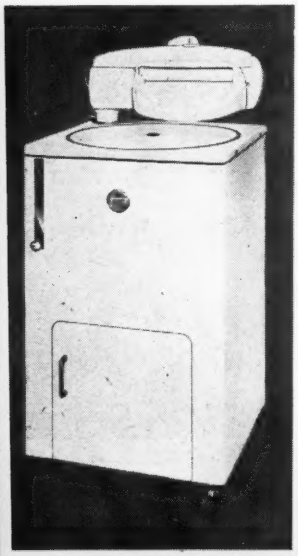
Bottom left: Ada (Halifax) "Coronation" washing machine

Below: Clegg & Coupe "Prefect" round type washer

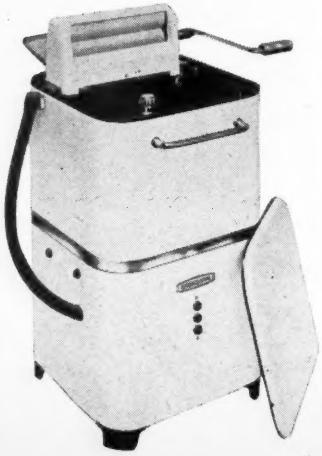


WASHING MACHINES . . . . . *continued*

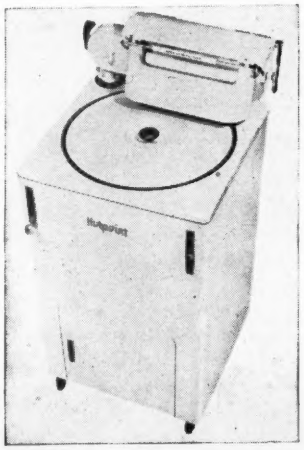
Manufacturer	Name or Model	Type	Size (H.W.& D in inches)	Tub Capacity (Dry Clothes)	Loading if heated	Method of Operation	Type of Wringer	Pump
EASICLENE PORCELAIN-ENAMEL (1938), LTD., Darlaston, South Staffs.	E.W.4	Cabinet	28×16×16	4½ lb	2·7 kW	Reciprocating	Hand	Gravity drainage hose
	E.W.1	Cabinet	28×16×16	4½ lb	—	Reciprocating	Hand	Gravity drainage hose
ENGLISH ELECTRIC CO., LTD., Domestic Appliance Division, East Lancashire Road, Liverpool, 10.	4004	Cabinet	48⅛×21¼×23 3/16	8/9 lb	—	3-fin central agitator	Power	Yes
	4005	Cabinet	48⅛×21¼×23 3/16	8/9 lb	2½/3 kW	3-fin central agitator	Power	Yes
	4600 Tumbler Dryer	Cabinet	27⅞×26¼×26⅛	8/9 lb	2¾ kW	—	—	—
ENTWISLE & KENYON, LTD., P.O. Box 39, Ewbank Works, Accrington.	"Ewbank" H.W.1	Cabinet	36×22×20	4½ lb	—	Plastic vaned agitator	Hand	No
	"Ewbank" H.W.2	Cabinet	36×22×20	4½ lb	—	Plastic vaned agitator	Hand	Yes
	"Ewbank" H.W.3	Cabinet	36×22×20	4½ lb	3 kW	Plastic vaned agitator	Hand	No
	"Ewbank" H.W.4	Cabinet	36×22×20	4½ lb	3 kW	Plastic vaned agitator	Hand	Yes
H. FISHER (OLDHAM), LTD., Pennant Street, Oldham, Lancs.	"Creston"	Cabinet	34×21×21	6 lb	—	Agitator	Power	Yes
	"L. Mark II"	Cabinet	34×21×21	7 lb	—	Agitator	Power	No
	"L. Mark III"	Cabinet	34×21×21	7 lb	—	Agitator	Power	Yes
	"E.R. II"	Cabinet	35×23×23	8 lb	2 or 3 kW	Agitator	Power	Yes
GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2.	D.E.200	Cabinet	36×22½×22½	8 lb	—	Plastic agitator	Power	Yes
HOOVER, LTD., Perivale, Greenford, Middlesex.	Mark I	Cabinet	30½×16¾×15¾	3½ lb	—	Pulsator	Hand	No
	Mark II	Cabinet	30½×17½×16½	6 lb	2 kW	Pulsator	Hand	Yes
	Mark III	Cabinet	30½×17½×16½	6 lb	—	Pulsator	Power	Yes
THE HOTPOINT ELECTRIC APPLIANCE CO., LTD., Crown House, Aldwych, London, W.C.2.	CH/P	Cabinet	36×23×22	7 lb	3 kW	Gyrator	Power	Yes
	CG/P	Cabinet	36×23×22	7 lb	—	Gyrator	Power	Yes
LONGFORD ELECTRIC CO., LTD., 6, Grosvenor Street, Manchester, 1.	"Longford" H	Cabinet	31¾×22½×20½	7 lb	—	Reciprocating agitator	Hand	No
	"Longford" P	Cabinet	31¾×22½×20½	7 lb	—	Reciprocating agitator	Power	No

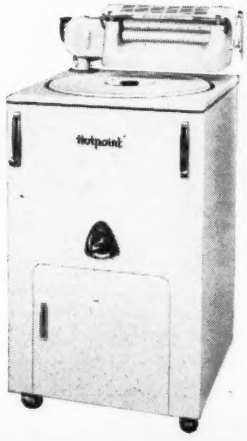


Left: G.E.C. D.E.200 washing machine and (below) Easiclene E.W.4 heated model



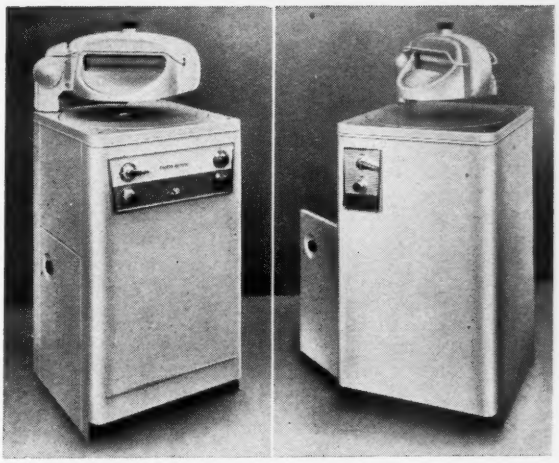
Hotpoint CG/P washing machine



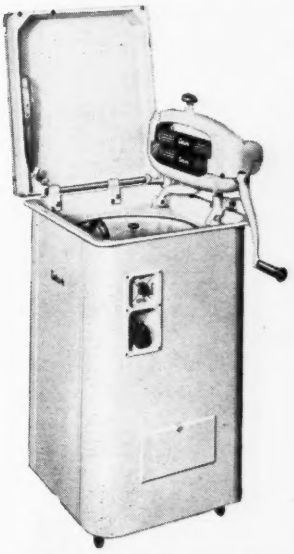


Hotpoint CH/P heated model

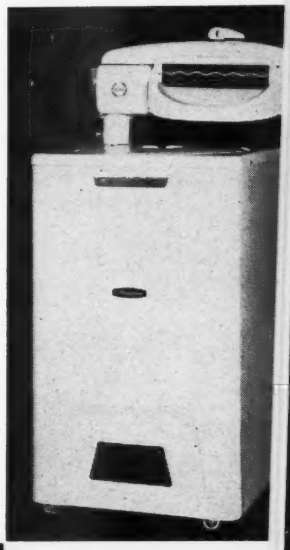
Exterior Finish	Tub Finish	Price (excl. tax)	Purchase Tax
Synthetic enamel	Vitreous enamel	£33 2 7	£13 4 8
Synthetic enamel	Vitreous enamel	£27 11 5	£11 4 3
Cream or white stoved enamel	Alkali resisting vitreous enamel	£52 0 0	£22 16 3
Cream or white stoved enamel	Alkali resisting vitreous enamel	£61 17 0	£27 2 9
Cream or white stoved enamel	Stoved enamel	£50 0 0	£21 18 9
Ivory stoved paint	Porcelain enamel	£36 13 3	£14 11 1
Ivory stoved paint	Porcelain enamel	£38 3 3	£15 4 3
Ivory stoved paint	Porcelain enamel	£42 6 9	£17 0 10
Ivory stoved paint	Porcelain enamel	£43 16 9	£17 14 0
Stoved enamel	Vitreous enamel	£47 5 0	£21 5 3
Stoved enamel	Vitreous enamel	£44 2 0	£19 16 11
Stoved enamel	Vitreous enamel	£46 4 0	£20 15 10
Stoved enamel	Vitreous enamel	£55 2 6 (2 kW) £55 15 0 (3 kW)	£24 16 2 (2 kW) £25 1 9 (3 kW)
White stoved enamel	Vitreous enamel	£55 0 0 (a.c.) £57 10 0 (d.c.)	£25 14 10 (a.c.) £26 18 3 (d.c.)
White enamel	Anodized aluminium	£27 0 0	£10 16 0
White enamel	Anodized aluminium	£43 0 0 £35 0 0 (non-heated)	£18 0 0 £14 8 0 (non-heated)
White enamel	Anodized aluminium	£42 14 6	£19 4 8
Cream or white stoved enamel	Aluminium	£62 10 0	£29 5 0
Cream or white stoved enamel	Aluminium	£55 0 0	£25 14 10
White stoved enamel	Aluminium	£30 0 0	£11 9 0
White stoved enamel	Aluminium	£40 0 0	£18 9 8

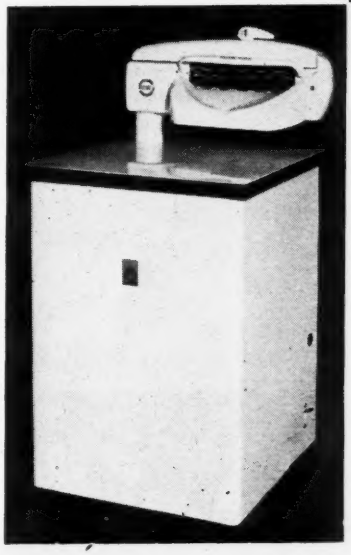


Left: English Electric 4005 and (right) 4004 washing machines

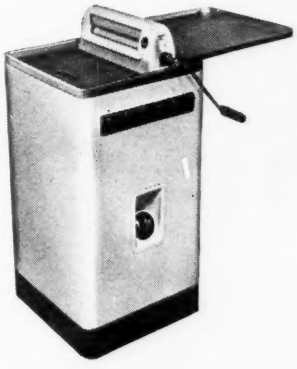


"Ewbank" electric washing machine (Entwisle & Kenyon)

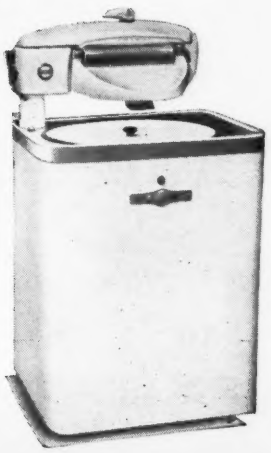




Above: Fisher "Creston" washing machine and (left) Fisher "L Mark II" washing machine



Hoover Mark II washing machine with heater

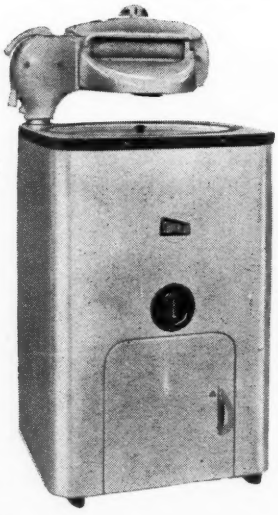


Longford washing machine

WASHING MACHINES . . . . . *continued*

Manufacturer	Name or Model	Type	Size (H.W. & D. in inches)	Tub Capacity (Dry Clothes)	Loading if heated	Method of Operation	Type of Wringer	Pump
PARNALL (YATE), LTD., 255, North Circular Road, London, N.W.10.	E.W.50	Cabinet	36×20⅜×20⅜	5½ lb	—	Reciprocating Bakelite agitator	Power	Yes
	E.W.50H	Cabinet	36×20⅜×20⅜	5½ lb	3 kW	Reciprocating Bakelite agitator	Power	Yes
	"Thor" 244	Cabinet	36×25×25	8 lb	—	Reciprocating Bakelite agitator	Spin dry	Yes
JOHN SENIOR & CO. (1954), LTD., Holywell Green, Halifax.	"Joy" Standard	Cabinet	32×22×22	8½ lb	—	Reciprocating agitator	Power	Yes
	"Joy" "Heat-o-matic"	Cabinet	32×22×22	8½ lb	3 kW	Reciprocating agitator	Power	Yes
W. & S. SUMMERSCALES, LTD., Keighley, Yorkshire.	"Fairy"	Cabinet	30×17×17	8 lb	3 kW	Rotary agitator	Hand	Gravity drainage hose
TAYLOR & WILSON, LTD., Taywil Works, Accrington.	"Taywil" 87	Cabinet	30×22×22	8 lb	—	Agitator	Power	Yes
UNIVERSAL BOILERS & ENGINEERING CO., LTD., Fulledge Works, Holmes Street, Burnley.	500	Cabinet	30×18×18	6 lb	—	Reciprocating agitator	Hand	No
	500 H	Cabinet	30×18×18	6 lb	2 kW	Reciprocating agitator	Hand	No
	TS	Cabinet	33½×25×25	10 lb	—	Reciprocating agitator	Power	Yes
WILKINS & MITCHELL, LTD., The Green, Darlaston, South Staffs.	"Servis" De-Luxe	Cabinet	44×23×23	9 lb	—	Gyrator	Power	Yes
	"Servis" Superheat	Cabinet	44×23×23	9 lb	3 kW	Gyrator	Power	Yes
	"Servis" S	Cabinet	44×23×23	4½/6 lb	2·3 kW	Impeller	Hand	Yes

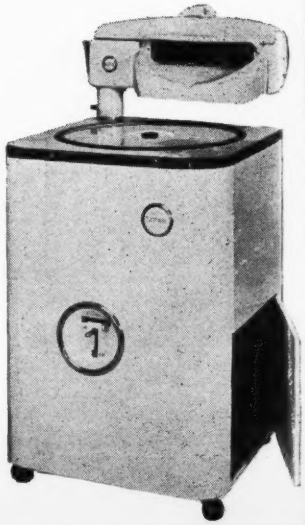
Universal Boilers model TS machine



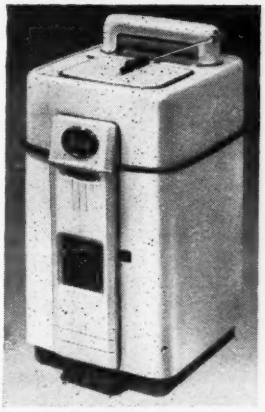
W. & S. Summerscales "Fairy" washing machine

"Thor" clothes washer and dishwashing attachment (Parnall (Yate))

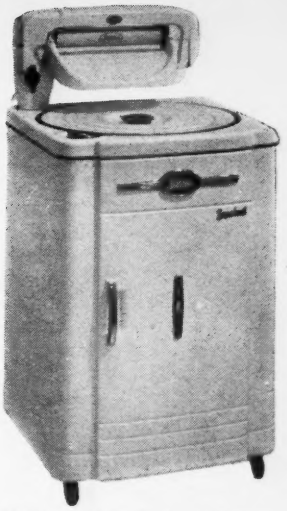
Taylor & Wilson "Taywil" washing machine



Pump	Exterior Finish	Tub Finish	Price (excl. tax)	Purchase Tax
Yes	Vitreous enamel top, stoved enamel body	Vitreous enamel	£47 6 11	£21 6 1
Yes	Vitreous enamel top, stoved enamel body	Vitreous enamel	£54 19 8	£24 14 10
Yes	Vitreous enamel top, stoved enamel body	Vitreous enamel	£68 0 0 Dishwashing attachment:— £20 10 0	£30 12 0 Dishwashing attachment:— £4 12 3
Yes	Vitreous enamel top, stoved enamel body	Vitreous enamel	£49 0 0	£22 1 0
Yes	Vitreous enamel top, stoved enamel body	Vitreous enamel	£54 0 0	£24 6 0
Gravity drainage hose	White cellulose	Vitreous enamel	£34 10 1 £29 10 5 (non-heated)	£13 8 7 £11 14 10 (non-heated)
Yes	Cream or white stoved enamel	Anodized aluminium	£51 0 0	£22 7 6
No	Stoved enamel	Hand tinned	£33 8 4	£13 16 10
No	Stoved enamel	Hand tinned	£36 9 8	£15 3 9
Yes	Stoved enamel	Vitreous enamel	£58 10 0	£27 7 7
Yes	White or cream stoved enamel	Vitreous enamel	£52 0 0	£23 8 0
Yes	White or cream stoved enamel	Vitreous enamel	£59 10 0	£26 15 6
Yes	White stoved enamel	Aluminium	£37 16 0	£15 14 5



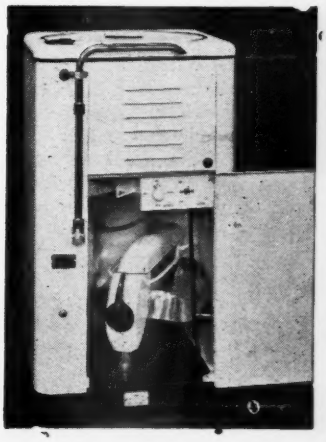
Wilkins & Mitchell "Servis" model "S"



Wilkins & Mitchell "Servis" superheat model

John Senior & Co.'s "Joy" washing machine

Parnall "EW.50H" washing machine



The Electrical Situation in Peru

THE difficulties which have hitherto retarded the development of electric power in Peru are largely dictated by the topography of the country. This is stated by Mr. K. D. Jamieson, First Secretary (Commercial) to H.M. Embassy at Lima, in his report on the economic and commercial conditions in Peru (H.M. Stationery Office, price 3s 6d net). In 1954 the total installed capacity was estimated at 321,000 kW, of which 214,000 kW or 67 per cent was hydro-electric, 26,600 kW or 8 per cent was based on steam, and 80,700 kW or 25 per cent on diesel oil, petrol, natural gas and other sources. Electricity supplied by public undertakings accounts for less than half of the total generated, more than half coming from plant belonging to large industrial concerns. Many villages have no electricity supply, and in others the supply is poor. This dearth of supply in the provinces is responsible for the small volume of sales of household appliances, and for the many privately owned generating sets.

A number of large scale hydro-electric projects depend on diverting water which at present flows eastwards to the Amazon so as to join it to one or other of the rivers flowing into the Pacific. These projects, however, depend on tunnelling through the Andes at altitudes of 14,000ft or more, and their execution is bound to be laborious and costly. In the absence of legislation guaranteeing an adequate return on money invested in the production of electric power, development has naturally been slow. In May this year, however, Congress approved an Electrification Law designed to provide conditions which will attract capital into the development of the country's electricity supply.

Dealing with the electrical imports of Peru, Mr. Jamieson says that the total for 1954 was 10,652 metric tons with a value of 349 million soles (£1 equals about 52 soles), of which the United Kingdom's share was 796 metric tons valued at 26 million soles. Imports under this heading include dynamos and motors, transformers, accumulators, batteries, domestic appliances, hand torches, meters, radio transmitters and receivers, incandescent lamps, stoves, refrigerators, lighting and heating apparatus, telephone equipment, machine tools, cables, wiring and electrical accessories of all kinds.

Although United Kingdom exporters now face keen competition, those who are already established in the Peruvian market have the advantage that their goods are known to the public, while newcomers can profit from the fact that United Kingdom goods are generally recognized to be of high quality and good taste.

Electronic Charge Storage

FOUR half-ton charge storage tubes, developed primarily for bright radar display systems, were described on 7th December at a joint meeting of the Measurement and Radio Sections of the Institution of Electrical Engineers by Messrs. R. S. Webley, H. G. Lubszynski and J. A. Lodge (E.M.I. Research Laboratories).

Two of the tubes were full-storage television camera tubes storing enough charge on an insulating or semi-conducting surface to permit of many reading scans for each charge. The other two used an unchanging charge pattern to modulate an electron beam. In three tubes the information to be stored had to be supplied as an optical image and in the fourth as an electric signal.

Continuous reading times ranging from a few seconds to several hours and revolutions up to 700 spots per picture diameter were stated to have been achieved. With some tubes erasure rates were readily controllable over a wide range. Electron beams were generated either by an electron gun and scanned by conventional means or by scanning a light spot over an extensive photo-cathode. The type of tube and its specification depended on the application proposed.

Opening the discussion Professor J. D. McGee (Imperial College) inquired whether the charges stored on the mosaic of the high-capacity pick-up tubes would not be used more effectively if the electron multiplier tube gave longer storage time.

Mr. L. S. Allard (G.E.C.) reported trouble at Wembley with the same defects, such as spots, on various other types of storage tubes. These were not all due to dust particles, and had evaporated on magnesium fluoride. They had also tried anodized aluminium. Besides white spots on the display tube there had been surface impurities; those on the base plate appeared to give spurious output signals.

Mr. L. J. Braybrook said that bright radar displays were required in aerodrome control towers, where it was desirable to use radar and yet see part of the airfield, and in air traffic control centres, where radar tracking was used in conjunction with procedural control which involved reading and writing in artificial light. He described an experimental system similar to one described in the paper (Section 3.2.10).

Mr. P. L. Waters (R.R.E.) regarded background uniformity of the tubes as a more serious trouble in performance than amplifier noise. He asked whether some fundamental problem in the mesh grid type of tube limited performance as regards background or whether it was a matter of controlling the manufacturing processes more carefully.

Mr. P. A. Newson said he would not have thought a half-tone tube particularly valuable for radar displays, but the title of the paper indicated that if their prime object was not television at least it was a projected major use for them.

Mr. F. H. Townsend referred to the considerable variation in storage time. He asked whether the only means of varying it was thickness of the layer, and whether one could obtain a continuous range of storage time for 10 min down to $\frac{1}{25}$ sec.

Mr. A. V. Lord thought the problem of standards conversion would be simplified by the use, where possible, of a beam modulation tube having direct viewing.

Diesel-Electric Crane

THE first of two diesel-electric travelling jib cranes has been built for London Transport and is now in service. It is a compact unit weighing 36 tons and can be hauled in train formation through tube tunnels at service speeds to any site on the Underground network. Previously, over a hundred miles of open track (nearly a third of the total on the system) could not be reached by rail by existing cranes owing to load restrictions, or could be reached only by considerable detours over " foreign " lines.

The design presented difficulties as the crane was required to be within the tube load gauge, to be capable of slewing a complete revolution and to have a tail radius which would effectively clear cable-posts, platforms, etc., while offering minimum obstruction to traffic on adjacent tracks, when working. In addition, its axle loading could not exceed 13 tons.

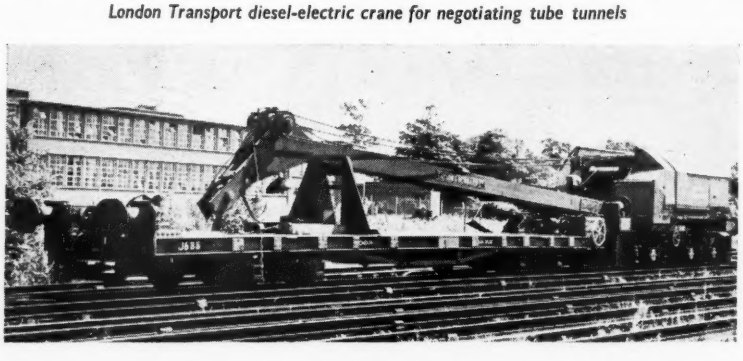
The makers, Taylor & Hubbard, Ltd., complied with this severe specification with ingenuity, particularly in regard to the articulation of the foot of the 37ft jib which is necessary for negotiating curves in tube tunnels. Such articulation is provided automatically when the jib is lowered on to the jib carrier wagon, and the re-engagement of the foot of the jib, when raised for use, is also fully automatic.

Hoisting, derricking, slewing and travelling are by means of independent 600 V motors, via reduction gearing. Power is provided alternatively from a diesel-generator unit mounted on the superstructure, or from a 600 V feed obtained from the current rail of an adjacent track. The power unit comprises a McLaren type M.R. three-cylinder engine, with a traction rating of 75 h.p. at 1,000 r.p.m., coupled to a 49·5 kW compound wound generator made by the Lancashire Dynamo & Crypto, Ltd.

Electro-mechanical solenoid brakes are fitted to the hoisting and derricking motions. The control gear is of V. G. Howell & Co. manufacture, the controllers being of cam-operated contactor type, operated by vertical lever gear in the driver's cab. The crane control panel gives protection for all motors.

A safe load indicator is fitted in the derrick rope and gives visible and audible warning of both " free-on-rail " and " blocked-up " conditions. A colour light panel (with traffic-light pattern sequence) is situated to the front and right of the driver, and a further panel, mounted outside the superstructure on the extreme left front, gives warning to men working at the load. This indicator operates from the 24 V starter battery, which is charged from a generator on the diesel engine, or alternatively from a separate motor generator set when the crane is operating from the track supply.

London Transport diesel-electric crane for negotiating tube tunnels



Automatic Heat Treatment

AN interesting example of industrial automatic control and processing is provided by the new electric furnace which has been supplied and installed in the Witton Works of the Metals Division of Imperial Chemical Industries, Ltd., by G.W.B. Furnaces, Ltd.

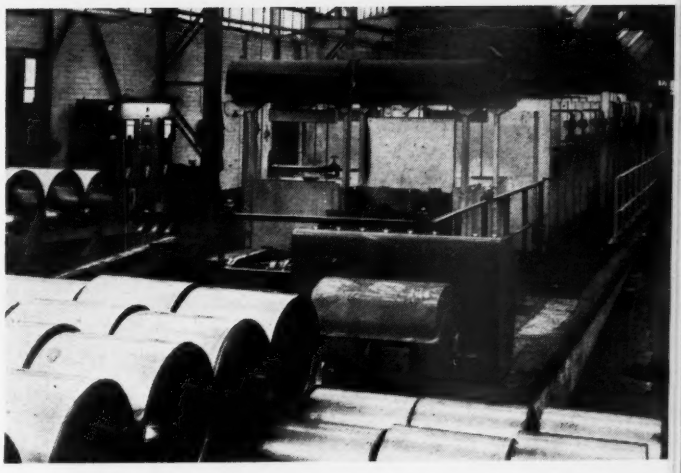
This resistance furnace is used for annealing coiled brass strip for the purpose of softening between rolling operations. The installation is of the walking beam design in which the coils are lifted for a few inches off the fixed portion of the furnace hearth by means of moving beams which then move forward and drop once more just below the fixed hearth level, and return to continue the cycle once more. The movement of the beams is arranged to be as near to rectangular as possible, and is effected by two separate motor mechanisms, one for vertical and one for horizontal movement. This method has been found to be superior to the eccentric cam method which tended to subject the charge to abrasion. This becomes quite pronounced in the case of long furnaces such as the unit now being described, in which the length of moving beam is nearly 50ft.

Viewed from above, the furnace is U-shaped, consisting of ingoing and outgoing beams set side by side so that the charge and discharge points are adjacent, while change in travel direction of the charge is effected by means of a transfer car mechanism inside the furnace at the bottom of the "U." The main heating section of the furnace consists of a twin chamber with a divided central wall, to ensure efficient air circulation, the length of this double section being 35ft. The furnace wall, roof and hearth are lined with refractory fire brick backed with graded insulation, while the fixed hearth, which supports the coils when they are temporarily static, is capped with heat resisting steel. Nickel-chromium strip elements are arranged on the wall faces and roof while heavy inverted V-section elements are fitted in the hearth. To achieve maximum heat transfer from the elements to the charge, a series of centrifugal fans is fitted in the roof of the heating chamber.

As a continuation to the double heating chamber, a fully bricked and insulated recuperative chamber assists in achieving the highest possible thermal efficiency since heat is recuperated by the ingoing coils from the outgoing charge. Along the outgoing section of the recuperative chamber a series of centrifugal fans is fitted to assist in heat transfer from the hot to the cold coils.

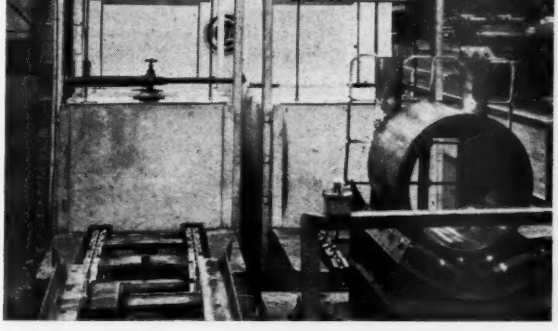
Finally, at the charge and discharge points are fitted short entrance and exit chambers with air or atmosphere locks in the form of lifting metal doors. In the exit chamber, high-pressure water sprays are provided for final cooling. To indicate the degree of recuperation obtained, it can be stated that the ingoing coils reach a temperature of approximately 250 deg C before entering the actual heating chamber, while electricity consumption is around 80 kWh/ton when heating up to 550 deg C.

The coils being processed each weigh about 960 lb and are usually 63/37 or 70/30 brass; the gauge is 0·120in or 0·160in, the strip width being 24½in. An output of 12 coils per hour is obtained. The furnace is designed for a maximum temperature of 850 deg C, while the normal working range lies between 550 and 600 deg C. The loading of 603 kW arranged in nine independently controlled zones is evenly distributed over the three-phase 50 c/s supply. An additional 150 kW is provided in the bricked section of the ingoing side of the recuperative chamber.



General view of the heat treatment furnace

When the furnace is in operation the coils are first received from the preceding rolling operation down an inclined conveyor, the axes of the coils being horizontal. On reaching the manipulator at the front of the furnace, the coils are up-ended on to a short slat conveyor section into the entrance chamber, through the atmosphere lock outer door. By means of a sequence control mechanism, the coil is passed through the inner door of the lock chamber and the ingoing beam then lifts the coils from the conveyor to start their journey through the furnace itself. At the bottom end of the furnace, a hydraulically operated transfer car moves the coils across on to the outgoing beam, all these movements being effected automatically. The sequence of operations is then repeated, only in the reverse manner, so that the outgoing beam places the coils on to the conveyor in the discharge chamber. When the exit door opens, the manipulator moves across and extracts the charge, whereupon it is up-ended so that the axis is once more horizontal, and the coils are then transferred to a gravity conveyor to await subsequent re-rolling.



Close-up of the coil manipulator

Supplies to Housing Estates

OUR Municipal Correspondent reports that a settlement is expected soon between representatives of local authorities and the Electricity Boards in the long-standing dispute on the supply of electricity to Council housing estates. Broad agreement was reached at a recent meeting of Councils and Boards. Now a small working party has been set up to consider details of a working formula.

The main points at issue have been the minimum standard of wiring required by the Boards and the question of freedom of choice of appliances. The Boards had long maintained that unless adequate use was made of the supply by Council house tenants their schemes would be uneconomic and would place an unfair burden on other consumers. It was therefore essential for them to charge the Council part of the cost of laying the supply unless the houses were properly provided with "adequate installations" or wiring, socket outlets and switches. The Boards had also laid it down that should appliances be provided by the Council, occupiers should be given freedom to choose electrical appliances.

The Councils, on the other hand, had maintained that it was essential for them to reduce the initial cost of providing houses to the minimum and to prevent any increased capital expenditure which would result from a complete freedom of appliances at local authority expense.

At the recent meeting, the Councils' representatives said they were prepared to fix cooker control units as required on the basis of a canvass of the initial tenants. The Boards said they felt they might accept this concession and themselves provide the control unit for any later transfers from gas to electricity. On the question of electric cookers, the Boards said they considered that authorities who installed appliances themselves in their houses did in some part take away the freedom of choice of the consumer. They accepted, however, that the agreement of local authorities to give freedom of choice to the first tenants would substantially meet their requirements as long as no obstacle was placed in the way of a future tenant who wished to change to electricity from another form of fuel.

For the Councils, it was stated that considerable expenditure might be involved in meeting the changing wishes of different tenants. There was room for agreement in the south of the country where local authorities generally left tenants to supply their own appliances, but there remained the difficulties in the North of England where local authorities provided cookers with their houses. It was agreed that freedom of choice of appliances would be given initially, but local authorities, although placing no obstacle in the way of a future tenant who wished to change to electricity from another form of fuel, would not provide electric cookers except in cases where a cooker of the required type was available in store from a previous change.

The Electricity Boards asked that the agreement should be extended to wash-boilers, water heaters and other domestic appliances which might be installed by the local authority. They said they would prefer it to be left to tenants to make their own arrangements about appliances, but recognized that in the North of England it was frequently a well established practice for local authorities to provide not only cookers but also wash-boilers, water heaters and similar appliances.

For the Councils, it was pointed out that solid fuel appliances were usually provided in their houses and a central heating system where there were blocks of flats. They accepted that they would provide the wiring and points, but they felt that supplementary heating should be provided by the tenant, if he wished it.

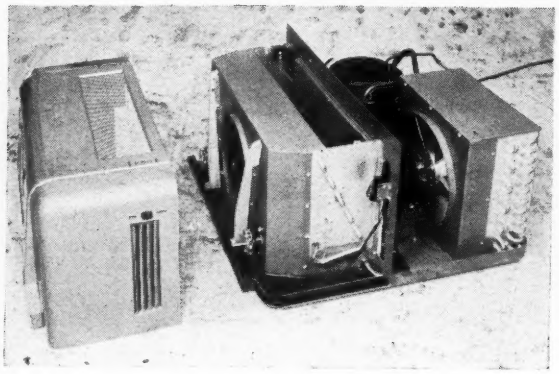
Air Conditioning Demonstration

OVER 150 people, including representatives of Middle East oil companies, were present at a demonstration of a new range of "Westair" climatizers and dehumidifiers, staged at the Abercorn Rooms, Bishopsgate, London, on Friday of last week by the manufacturers, Westool, Ltd., St. Helen's Auckland, Co. Durham. The range consists of six units, namely four ½-ton capacity climatizers—standard, standard home, tropical and Continental models; a 1 ton "Duplex" climatizer; and a dehumidifier. Reference to ½ ton means that the cooling effect of the unit is approximately equal to the cooling effect of half a ton of ice in twenty-four hours.

The standard model embodies a hermetically sealed refrigeration system for the cooling and dehumidifying of the room air. The room air is circulated through the unit by the evaporator fan, which takes the air in through the top grills, through a filter, and a cooling coil and blows it cool and dry back into the room. The heat extracted from the air is pumped away by the compressor and rejected outside via the condenser through which another fan circulates outside air. The moisture extracted from the room runs along an inclined level, formed in the base tray of the unit, to this latter fan by means of which it is picked up and atomized outside. When cooling is not required it can be used for ventilation only.

Primarily designed for use in offices and the home, the air conditioning units provide for climates ranging from temperate to tropical, the largest model being suitable for rooms up to 3,200 cu ft in size. Normal fixing is into windows or wall apertures in rooms having external walls.

Other exhibits displayed during the demonstration consisted of solenoids and transformers which are also manufactured by the company.



A ½-ton capacity "Westair" standard model climatizer showing interior construction

Planned Lighting

THE importance of planning general lighting according to the plant layout was stressed by Mr. W. Imrie-Smith, chief lighting engineer of Benjamin Electric, Ltd., when he recently addressed the Ipswich and District Electrical Association on the "Analytical Approach to Industrial Lighting."

Mr. Imrie-Smith said that it was the lighting engineer's task to minimize the amount of "nerve energy" expended by the operatives in seeing their work. By analysing the characteristics of the visual field, he showed the importance of suitable lighting of all visible surfaces, and how plant and interior colouring would assist in obtaining suitable brightnesses. The choice of colours involved many psychological factors, but the scheme should be developed from consideration of an appropriate revealing contrast at the working positions.

GENERATION AND DEVELOPMENT

Hire Schemes Dropped

As one means of meeting the conditions created by the Government's restrictions upon capital expenditure the Gas Council and the Central Electricity Authority have agreed that from 1st January they will not let out further appliances on hire.

At its last week's meeting the East Midlands Electricity Consultative Council registered "the strongest possible protest" at the proposal to curtail simple hire facilities in the East Midlands and asked the Board to convey its protest to the C.E.A.

Television and Street Lighting Control

A complaint that television sets are interfering with their system of auto-remote control of street lighting has been made by the Poole Borough Council to the Association of Municipal Corporations. Commenting on this, the General Purposes Committee of the Association say it is understood that the relays in use in Poole for remote street lighting control purposes are sensitive to the d.c. potential set up in the electricity supply cables by the use of television receivers. As a result, some street lamps are extinguished on frequent occasions during street lighting hours. The Committee reports that at present it has no information of any similar difficulty having been experienced elsewhere but it states that it will, if necessary, consider the matter further "in the light of more detailed information which members may be able to supply."

Power and Irrigation in Morocco

The annual report of the British Chamber of Commerce in French Morocco contains a section reviewing the growth of electricity supply in the Protectorate. Since 1924 generation and transmission have been in the hands of the Energie Electrique du Maroc, which in the past few years has carried out a number of important thermal and hydro-electric schemes.

In 1949 a 31,200 kW hydro-electric station was brought into service at Im-Fout, on the Oum-er-Rebia, the considerable reserve of water contained by the dam being used to irrigate the grain-producing plain of Abda-Doukkala. Another hydro-electric development, at Daourat, added a further 17,000 kW in 1950. A steam station built on the outskirts of Casablanca to utilize low-grade fuel from the Djerada coal mine was commissioned in 1952; the present capacity of 32,000 kW will ultimately be raised to 120,000 kW. Since 1953 hydro-electric stations have been put into service in successive stages at Bin-el-Ouidane (120,000 kW) and at Afourer (92,000 kW). These dams, and some less important ones, besides producing electricity irrigate about 286,500 acres of the plains of Tadla and Srharna, previously arid.

Morocco at present possesses plant capable of producing on an average about 1,300 million kWh. Last year the output was 857·6 million kWh, an increase of 8 per cent on 1953.

Electricity in Ceylon

A three-member committee is to be appointed in Ceylon to make a comprehensive inquiry into breakdowns of the hydro-electric power plants at Laxapana. The most recent affected one of the three 8,500 kW generators, and since occurring about three months ago consumers have been asked to keep their use of power to the minimum. Meanwhile, the Government has sanctioned almost twice the expenditure provided in the current estimates for the construction of a large power house at Jaffna, in North Ceylon.

The Ceylon Electric Development Association has offered to educate the rural people in the use of electricity. To begin with, the Association suggests that a suitable area should be chosen for a pilot project and that the Department of Electrical Undertakings should provide the equipment and bear the cost of the installations. The Association offers to organize practical demonstrations and film shows and generally conduct a campaign to make the rural population "electricity conscious."

The first step in the implementation of the biggest irrigation and power project under the second six-year plan in Ceylon, the Walawe Ganga scheme, will be taken in June next when the Government will call for tenders for its construction. The Minister of Lands and Land Development, Mr. P. B. Bulankulame, stated recently that he was in consultation with the engineers of the Irrigation Department for drawing up a programme of work for the scheme. According to present indications, the project will cost Rs.175 million.

Snowy River Progress

Our Australian correspondent reports that work on the Snowy River project is proceeding according to schedule and another important stage will be reached when the New South Wales Government, the body responsible for the Adaminaby Dam, calls tenders during the next three or four weeks for 9·4 million cu yd for filling and other works to complete the dam. The State Minister for Public Works stated that he expected Australian, British, Continental and American companies to tender for the work, judging by the inquiries he had received. He said that the dam would have a storage capacity of nearly 4 million acre-feet, and maximum water depth would be 370ft. Its wall will be 385ft high, 2,000ft wide at the base, and 40ft at the top.

Street Lighting

A comprehensive survey is to be made of street lighting in BELFAST. This follows a report that because of the increase in the price of gas it was estimated that there would be a rise of almost £11,300 in expenditure on gas street lighting in the current financial year.

A sodium street lighting scheme has recently been completed in Ruislip and Northwood, some 260 Mazda "Amber" sodium vapour lanterns having been installed by the U.D.C. in three of the main roads. The enclosed lanterns housing 140 W lamps are top entry mounted on Concrete Utilities granite finish columns at a height of 25ft, spaced at staggered intervals of 120ft. Made of totally weatherproof and easily cleaned aluminium alloy and moulded "Perspex," the lanterns have sealed refractor panels with external fittings of stainless steel. The contractors were Erecon, Ltd.

KIRKBURTON Highways Committee at a special meeting resolved that its future policy should be to convert gas street lamps to electric lighting.

A lighting scheme for Great North Way, HENDON, is estimated to cost £12,163.

RAMSBOTTOM U.D.C. is seeking sanction to borrow £4,000 for the conversion of 100 gas lamps in the town to sodium lighting.

Following an intimation that charges for gas street lighting were likely to increase to £20,000 per annum, the WALLSEND Town Council has asked the borough engineer (Mr. G. N. Teasdale) to prepare estimates for installing electric street lighting on main roads and bus routes.

MIDDLESBROUGH Town Council has received Ministry sanction to spend £12,200 on the erection of 93 street lamps on the cross-town route and £6,300 for 62 lamps on a section of Acklam Road.

RUSHDEN, Northants, U.D.C. is to spend £5,349 on street lighting improvements.

TYNEMOUTH Town Council is to install sodium lighting in Queen Alexandra Road West, Queen Alexandra Road, and Trevor Terrace, North Shields, and also in Preston North Road between Hartburn Road and the borough boundary.

NORTHAMPTON Town Council is to provide 360 lamps to complete the Class "A" lighting of main roads and 1,079 lamps for the Class "B" lighting of district roads.

HINCKLEY U.D.C. proposes to extend its main road lighting scheme at a cost of £2,970.

Financial Section

STOCKS and SHARES

FIRMNESS of share prices in the industrial market has again been the most satisfactory feature in the Stock Exchange. Many shares made further progress towards the recovery of losses sustained in the rout of prices which took place between the all-time peaks of last July and the time of the supplementary Budget in October. In that period, for instance, A.E.I. ordinary fell from 95s to 75s 6d, and are now 85s; G.E.C. from 76s 6d to 60s, against the present market price of 64s 6d; Parsons from 95s to 76s 3d against 83s 9d now; Plessey from 87s 6d to 63s 9d and up again to 83s 6d.

Better Prices

Westinghouse Brake shares were marked up 6s 6d to 96s 6d on reports of a coming "rights" issue, and in anticipation of the final dividend declaration. B.I.C.C. shares went further ahead to 52s 6d after the date for the final call on the new shares. The two classes will rank equally when the old are quoted ex the 4 per cent interim dividend, to which the new are not entitled. Tube Investments new shares were higher again at 64s 9d. Dealings began this week in Pye new "A" deferred shares at a premium of 9s 9d on the price of 12s 6d at which they are offered to present deferred shareholders. Improvements of half-a-crown or more were recorded in, amongst others, Wolf Electrics, which reached a new high point at 26s 3d; in Babcocks, Automatic Telephones, Reyrolles and Vactrics.

Reliance-Clifton Issue

Reliance-Clifton Cables and Industrial Products 5s ordinary shares are now quoted at 13s 6d ex the scrip issue, which gives shareholders one new 5s "A" (non-voting) share for every 5s stock held. The new shares have been dealt in at around the same price. They are at present transferable free of stamp, and rank equally with the old for future dividends. The ordinary distribution for 1954 would be equivalent to 11¼ per cent on the increased capital of £560,000, and on that basis the prospective yield on the shares is under 4¼ per cent. The interim for the present year has, however, been raised.

Cable Conditions

The Reliance-Clifton Cables Company's good account of current business follows closely on other favourable reports from the cable manufacturing industry. These have been responsible for a marked revival of interest in the shares concerned. Substantial improvement in this year's profits was reported by B.I.C.C. at the time of the company's big "rights" issue at the end of October, since when the price of the company's shares has risen from 46s to 52s 6d (as noted above). Johnson & Phillips £1 shares have come up from about 40s to 45s since the interim report, issued a month or so ago, of considerably better trading results in the current year, and of a healthy order book. Hackbridge Cable

The Week's Price Changes

Company or Board	Nom. Value	Middle price 12th Dec.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1955 Highest	1955 Lowest
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	80½		3	3	3 14 6	94¾	76½
Brit. Elec. 1974/77	100	79½		3	3	3 15 6	93½	75½
Brit. Elec. 1976/79	100	83½		3½	3½	4 3 9	98¾	80½
Brit. Elec. 1974/79	100	95½		4¼	4¼	4 9 0	109	90½
Overseas Electric Supply								
Calcutta Elec.	£1	20/9		6†	6†	5 15 9	22/6	20/9
East African Power	£1	21/-	−3d	7	7	6 13 3	24/6	19/9
Nigerian Elec.	£1	21/6		10	10	9 6 0	27/-	21/-
Palestine Elec. "A"	£1	21/-		Nil	Nil	Nil	22/9	21/-
Perak Hydro-Elec.	£1	17/6	−6d.	10	10	—	22/3	17/9
Equipment and Manufacturing								
Aberdare Cables	5/-	13/-		12½	17½	6 14 6	14/6	11/-
Aerialite	1/-	6/9		88½	45*	6 13 3	6/9	5/3
Allen, W. H.	£1	74/6		20	20	5 7 6	83/9	74/6
Aron Elec. Ord.	£1	55/6		15	15	5 8 0	63/9	55/6
Assoc. Elec. Ord.	£1	85/-	+2/6	11¼	14	3 6 0	96/-	62/6
Automatic Tel. & El.	£1	68/9	+5/-	15	15*	4 7 7	79/6	60/-
Babcock & Wilcox	£1	82/6	+3/9	12*	15	3 12 9	98/-	68/6
Baldwin, H.	2/-	5/-	−3d.	20	20	8 0 0	5/6	4/4
Bakelite	10/-	33/-		12½	16	4 17 0	34/6	27/-
British Aluminium	£1	54/6	+2/-	10	12	4 8 0	58/-	35/3
B.I. Callender's	£1	52/6	+2/6	10	12½‡	4 15 3	55/3	44/9
B.I. Callander's 6% Pref.	£1	22/6	−6d.	6	6	5 6 9	26/6	21/9
British Thermostat	5/-	31/3		27½	27½	4 8 0	35/-	22/6
British Vac. Cleaner	5/-	8/6	+3d.	25	30	—	10/-	6/6
Brook Motors	10/-	45/6		20	25	5 10 0	47/-	39/9
Brush Ord.	5/-	7/6		6	10	6 13 3	9/6	7/6
Bulgin, A. F.	1/-	7/-		30	45	6 8 6	8/-	4/-
Burco Dean	5/-	12/6		—	—	—	17/3	12/-
Chloride El. Storage	£1	67/6		12½	17½	5 4 6	77/6	58/6
Clarke Chapman	£1	95/-		20	20*	4 4 3	102/6	68/9
Cole, E. K.	5/-	21/9	+9d.	27½	27½*	4 0 6	25/6	18/3
Cossor, A. C.	5/-	9/9		10	15	7 13 9	14/-	8/9
Crabtree	10/-	28/6		20	20	7 0 3	34/6	27/6
Crompton Parkinson Ord.	5/-	15/-		20	16*	5 6 8	19/9	15/-
De La Rue	5/-	21/-	+9d.	20	30	7 2 9	26/-	17/-
Decca	4/-	43/3		35	56¼*	—	48/9	31/-
Desoutter	5/-	31/3		20	25	4 0 0	35/-	25/6
Dewhurst	2/-	11/-		24	30	5 9 0	11/3	7/3
Dicograph Tel.	2/-	7/3		20	20	5 10 3	9/3	6/6
Dubilier Condenser	1/-	4/6		25	25*	5 11 0	5/7	3/1
E.M.I.	10	28/6	−9d.	10	15	5 3 6	37/-	25/3
Electrical Components	5/-	15/-		20	25	8 6 8	21/3	13/9
Elec. Construction	£1	29/9		15	8½	5 14 3	41/3	28/9
Enfield Cable Ord.	£1	19/-		Nil	Nil	Nil	25/3	18/6
English Electric	£1	65/6	+6d	10	12½	3 17 0	86/9	54/3
English Electric 3½% Pref.	£1	14/6		3½	3½	5 3 6	16/9	14/-
Ericsson Tel.	5/-	45/-	+1/3	25†	25*†	2 15 6†	46/6	29/-
Ever Ready	5/-	33/-	+6d	40	35*	5 7 9	38/-	22/3
Falk Stadelmann	£1	46/3		15	17½	7 11 3	52/6	42/-
G.E.C. Ord.	£1	64/6	+2/-	12½	14	3 17 6	80/3	51/3
G.E.C. 6½% Pref.	£1	23/9		6½	6½	5 9 6	28/4	23/6
General Cables	5/-	16/9		30	30	8 19 0	17/-	15/-
Greenwood & Batley	£1	47/6	+2/6	17½	17½	7 7 4	57/6	45/-
Hackbridge Cable	5/-	23/9	+6d.	20	25	5 5 3	23/9	14/-
Hackbridge & Hewittic	5/-	20/9	+9d.	25	30	—	24/9	17/-
Hall Tel. Acc.	10/-	31/6		10	10	3 3 6	32/-	11/-
Heatrae	2/-	5/-		12½	15	6 0 0	5/9	4/3
Henley's	10/-	17/3	+6d.	10½	10½	6 1 9	21/3	15/9
Holophane	5/-	18/9		25	30	8 0 0	19/9	16/-

* After scrip issue. † Free of income tax. ‡ Dividend forecast.

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.

5s shares have hardened lately from 20s 9d to 23s 3d, and Telegraph Constructions from 30s to 34s 6d.

Plessey Dividends

Plessey 10s shares have made another strong advance since the appearance of the full report, containing the chairman's annual review. The favourable impression made by the excellent figures presented in the accounts for 1954–55, and by the formidably strong appearance of the balance-sheet, was reinforced by the chairman's statement on dividend policy. Decisions on the interim and final distributions are each taken by reference to the six months under consideration. Unless an alteration is called for by a change in conditions, one way or the other, any dividend declared is likely to be succeeded by another at the same rate. For the last period, the company followed a 12½ per cent interim with a 15 per cent final. It is thought proper, consequently, to regard the shares as being on an annual dividend basis of 30, rather than 27½ per cent. Adoption of the former rate brings the yield on the shares at 83s 6d to a fraction over 3½ per cent.

in Electrical Investments

Company or Board	Nom. Value	Middle price 12th Dec.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1955 Highest	1955 Lowest
Equipment and Manufacturing—continued						£ s d		
Hoover	5/-	40/-	+6d	45	70	8 15 0	52/6	35/6
I.C.I.	£1	49/-	+1/-	15	10*	4 1 9	61/9	38/3
Intl. Combustion	5/-	18/-		20	25	—	24/6	16/-
Johnson & Phillips	£1	45/-	+1/-	15	15	6 13 4	52/6	39/6
Lancashire Dynamo	£1	47/6	+3/-	14	15	—	56/5	37/3
Laurence, Scott	5/-	16/9	+6d	20	12½*	3 17 0	19/6	14/6
Lister, R. A.	£1	30/-		12	9·3*	6 4 0	40/-	28/9
London Elec. Wire	£1	51/3	+6d	10	12½	4 18 0	61/3	50/6
Lucas, J.	£1	40/-		7½	7½	3 15 0	56/6	38/9
Marryat & Scott	2/-	10/3		25	30	5 17 0	13/-	9/6
Mather & Platt	£1	60/6		15	13·4*	—	75/-	48/-
Metal Industries	£1	27/3	+2/3	9	9	6 12 0	38/-	25/-
Midland Elec. Mfg.	£1	50/-		15	10*	4 0 0	55/-	44/-
Morphy-Richards	4/-	28/3	+6d	35	50	7 1 6	35/-	27/-
Murex	£1	69/6		15	20	5 15 1	67/6	49/3
Newman Ind.	2/-	2/9		10	10	7 5 6	3/6	2/4
Oldham & Son	1/-	3/-		17½	20	—	3/6	2/1
Parnall (Yate)	5/-	8/3		8	14	8 9 9	13/2	7/3
Parsons, C. A.	£1	83/9	+2/6	7½	10	2 7 9	100/-	56/-
Plessey	10/-	83/6	+2/3	20	30†	3 11 6	89/-	55/-
Pye "A" Deferred	5/-	23/3x.r		20	12½*	—	32/9	14/3
Revo	10/-	12/6		9	9	7 4 0	15/6	12/6
Reyrolle	£1	51/4	+5/-	13⅜	15	2 17 2	127/6	89/-
Rheostatic	4/-	12/3		20	22½	—	14/3	9/3
Richardsons Westgarth	5/-	16/-		15	16⅔	5 4 3	19/-	11/-
Scottish Cables	4/-	17/3	+6d	27½	27½	6 7 6	22/6	16/3
Smith (England), S.	4/-	14/6		17½	17½	4 16 6	20/-	14/9
Southern Areas	£1	30/6		7½	10	6 11 3	38/-	27/6
Strand Elec.	5/-	8/9	+6d	17½	15*	8 11 6	13/3	7/6
Sturtevant	5/-	29/6		18·9	14·4*†	2 8 6†	35/9	21/-
Sun Elec.	£1	35/-		15	20	—	35/-	33/9
Switchgear & Cowans	5/-	17/-	+3d	10	20	5 17 9	17/-	11/-
Taylor Tunnicliff	5/-	14/3	+6d	12½	15	5 5 3	16/3	11/3
T.C.C.	10/-	43/9		30	25*	5 14 3	53/9	41/-
T.C. & M.	£1	34/6	+3/6	8½	8½	4 18 7	40/9	29/3
Telephone Mfg.	5/-	8/3		10	10	6 1 3	11/6	7/9
Thorn Elec.	5/-	22/-	+3d	20	15*	3 8 2	33/-	13/9
Thornycroft	£1	48/9	+1/3	15	15*	6 3 0	48/9	34/6
Tube Investments	£1	62/6	+2/6	22½	14*‡	4 9 6	62/6	55/-
Vactric	5/-	18/9	+2/6	10	15*	4 0 0	22/-	12/-
Veritys	5/-	8/-		12½	12½	7 16 3	12/2	7/-
Walsall Conduits	4/-	14/-	+3d	70	70	—	17/3	12/-
Ward & Goldstone	5/-	37/6	+1/3	50	30*	4 0 0	45/-	32/6
Watford	2/-	7/-		22½	25	—	8/9	6/3
Westinghouse Brake	£1	96/6	+6/6	16	18	3 14 7	110/-	82/-
West, Allen	5/-	13/6	+6d	17½	15*	5 11 0	16/6	8/-
Wolf Electric	5/-	26/3	+2/6	17½	20	3 16 3	26/3	16/1
Trusts, Transport and Communications								
Anglo-Am. Tel.: A. Ord.	100	70	−2½	6	6	8 11 5	88	67½
Ord.	100	45		3¾	3¾	8 6 8	54½	45
Anglo-Portuguese	£1	22/-		8	8	7 5 6	27/-	21/-
Brit. Elec. Traction: Def. Ord.	5/-	19/-	−6d	50	22½*	5 18 6	24/3	19/-
Cable & Wireless: Ord.	£1	43/-		9	10	4 13 0	54/-	39/6
4% Loan	100	92½		4	4	4 6 6	100	92/-
Calcutta Trams	£1	26/9		6†	7½†	5 12 3†	26/9	20/-
Cape Elec. Trams	£1	18/9		5½	7½	8 0 0	19/6	16/6
Marconi Marine	£1	31/3		10	10	6 8 0	41/3	31/3
Oriental Tel. Ord.	1/-	79/6		16	—	—	102/6	72/6
Telephone Rentals	5/-	11/6	+3d	10	12½	5 8 9	13/6	9/6

Contactor Switchgear

The annual meeting of the Contactor Switchgear Co., which was made public two years ago, was due to be held on Wednesday of the past week. In the previously issued annual report for the twelve months to last July, the net surplus, after a reduced tax charge, was shown to have improved from £50,000 to £56,000. The dividend of 18 per cent was covered about two and a half times by the available earnings. The chairman's statement described the order book as being in a healthy state, and the company's gear as in use by an increasing number of industries. The 5s ordinary shares stand at 13s, at which level the yield works out at nearly 7 per cent.

Wright & Weaire

The 5s ordinary shares of Wright & Weaire, the manufacturers of magnetic tape recorders and electronic components, were marketed early this month and have lately been changing hands around 17s. In the prospectus, profits are shown to have been in the process of a steady expansion since 1950, when tape recorders began to be sold, and to have reached £69,000 (before tax) in 1954. For the year now ending, the directors expect a surplus of not less than £85,000, on which basis they would feel justified in recommending, next May, a dividend at the rate of 25 per cent. On the cautious assumption of profits at the £75,000 level, such a distribution is shown to have two-fold cover by earnings. The prospective yield on the shares is thus 7·3 per cent.

Preference Shares

In the lists of preference shares recently on offer, mention may be made of fairly substantial lines of Electrical Apparatus 8 per cents at 25s, yielding 6·4 per cent; of General Cable 6 per cent 10s preference shares at 10s 7½d, yielding 5·6 per cent; and of Ferranti 5 per cent second preference at par. The 5 per cent issues of Walsall Conduits at 18s 3d, Hackbridge Cable at 19s, and Telegraph Construction also at 19s, offer returns of between 5¼ and 5½ per cent. Lancashire Dynamo 5½ per cents have been available at 20s 9d and A.E.I. "eights" at 30s 6d.

REPORTS and DIVIDENDS

Electric & Musical Industries, Ltd.—The company's work in the field of automatic machine tool control was referred to by Mr. J. F. Lockwood (chairman) at the annual meeting last week. He said it was believed that the company was perhaps the first in the world to have automatic electronically controlled machine tools working satisfactorily under commercial conditions in a customer's factory. Development work was proceeding on apparatus of more complex design to meet the requirements of particular industries, especially aircraft. It was expected that this form of automation would rapidly gain favour because it would reduce production costs and widen the scope of experimental work. A long-term agreement had been made with the Cincinnati Milling Machine Company of America which, it was hoped, would result in a substantial export of electronic equipment and provide a useful dollar income. Development work was proceeding on the application of the same technique to other manufacturing processes. Next year a pilot model would be completed of a data processing system designed to do work not practicable with the equipment at present available here or abroad.

After dealing with other aspects of the company's activities, including research work, the chairman said that in the export market competition was very strong and was likely to get stronger, so that their products could only be sold abroad if the prices were really competitive. In the past financial year their total merchandise exports amounted to no less than £4,000,000. Plans for the future had been made in the belief that their sales in most territories would show further increases. It was too early yet to assess the effect of future wage increases on both demand and costs. They were seriously concerned about this but despite the difficulties he thought they could look forward to the future with confidence.

The Radio & Television Trust, Ltd.—The consolidated profit and loss account shows a profit, before taxation, of £47,234 for the year to 31st March last, against £48,086 for 1953-54. The report points out, however, that the figures are not comparable as in the year under review there was only one operating subsidiary company, Airmec, Ltd. To the profit is added £41,500, adjustment of bank interest for previous years. The charge for taxation is £38,191. The Britannic Electric Cable & Construction Co., Ltd., was sold in January last and the surplus of £184,085 on the sale of these shares has been brought in. The net result is that the adverse balance carried forward has been reduced by £186,304 to £501,385. As a result of an offer in May last by Crompton Parkinson, Ltd., that company has acquired the whole of the cumulative redeemable preference stock and also 82 per cent of the sinking fund certificates. The board has decided to defer for the time being proposals for a capital reconstruction scheme.

British Insulated Callender's Cables, Ltd., has declared an interim dividend of 4 per cent (against 2½ per cent). The increase is to achieve a more balanced distribution between the interim and final dividends.

Hick, Hargreaves & Co., Ltd., are paying an interim dividend of 5 per cent (unchanged).

Max Stone, Ltd., has announced an unchanged interim dividend of 30 per cent.

New Companies

Charles Sambridge (Candelabra), Ltd.—Registered 3rd October. Capital £1,000. Manufacturers and repairers of, maintenance contractors for and dealers in electric fitings, etc. Directors: C. B. Sambridge and S. E. Dale. Regd. office: Nithsdale, Ingatestone, Essex.

C.C.L., Ltd.—Registered 6th October. Capital £6,000. Electrical and mechanical engineers, manufacturers of components for radio, television and electronic industries, etc. The first directors are not named. Solicitors: Henry E. Goodrich, 3, Field Court, Grays Inn, W.C.1.

H. & V. Electrical Co. (Bognor), Ltd.—Registered 29th September. Capital £1,500. Electrical engineers and contractors, etc. Directors: R. T. Vincent and Mrs. Florence E. Vincent. Regd. office: 3, The Parade, Pagham, Sussex.

Abrams & Wright (Electronics), Ltd.—Registered 25th October. Capital £500. Manufacturers of and dealers in electrical, electronic, wireless, telephone and telegraph apparatus, etc. Directors: G. A. Abrams, Mrs. Mary E. Abrams, F. W. Wright and Mrs. Margaret J. Wright. Regd. office: Victoria Road, Rushden, Northants.

Electro-Services (Battersea), Ltd.—Registered 27th October. Capital £2,000. Manufacturers and distributors of, agents for and wholesale and retail dealers in all kinds of electrical goods, radio and television sets, etc. Directors: G. R. Blank and Minnie H. Blank. Regd. office: 221, Battersea Park Road, Battersea, S.W.11.

Allray Electrical & Engineering Co., Ltd.—Registered 17th November. Capital £500. Electrical engineers and general electrical installation contractors, etc. Directors: A. T. Duff and Barbara E. Duff. Regd. office: 127, Port Road, Barry.

English Telephone Co., Ltd.—Registered in Northern Ireland 15th September. Capital £10,000. Manufacturers and exporters of telephone apparatus and equipment of all kinds, etc. English address: Beresford House, Mount Pleasant, Alperton, Wembley, Middx. Directors: C. Will and C. F. Finch.

W. J. Redman, Ltd.—Registered 24th November. Capital £1,000. General electrical and radio and television engineers and contractors, etc. Directors: W. J. Redman and A. C. Redman. Regd. office: 65, Tarrant Street, Arundel, Sussex.

Electrical Appliances (Ruislip), Ltd.—Registered 12th November. Capital £1,000. Development and manufacture of scientific and medical appliances, etc. Directors: C. T. Taylor, L. N. Parker and A. T. G. Fairbrass. Regd. office: 265, Strand, W.C.2.

E. Sockett, Ltd.—Registered 21st November. Capital £3,000. To acquire the business of an electrician and dealer in radio, television and electrical apparatus now carried on by E. Sockett at 115, Carlisle Road, Sheffield. Directors: E. Sockett and Mrs. Lucy Sockett. Regd. office: 115, Carlisle Road, Sheffield.

Increases of Capital

Arcolectric (Switches), Ltd.—Increased by £50,000, in £1 shares, beyond the registered capital of £50,000.

Grundig (Great Britain), Ltd.—Increased by £49,971, in £1 ordinary shares, beyond the registered capital of £10,029.

A. H. Hunt (Capacitors), Ltd.—Increased by £300,000, in 4s ordinary shares, beyond the registered capital of £200,000.

Liquidation

Vicom & Co. (Sales), Ltd., electronic engineers.—Winding up voluntarily. Liquidator, Mr. B. Phillips, 76, New Cavendish Street, London, W.1, appointed 28th November. Particulars of claims to the liquidator by 30th December.

Bankruptcies

A. Fielder, 314, Shortheath Road, Erdington, Birmingham, and 4, Cooksey Lane, Erdington, Birmingham, trading as A. Fielder & Co., radio and electrical retailer.—Trustee, Mr. R. K. Clark, Somerset House, 37, Temple Street, Birmingham, 2, released 28th November.

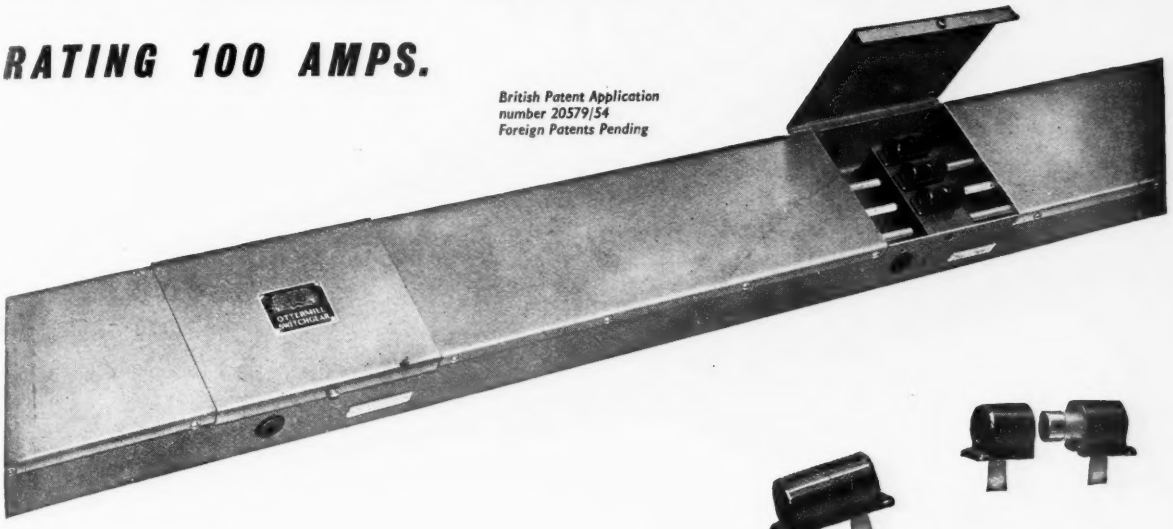
W. E. Sparrow and **F. Sparrow,** electrical contractors, carrying on business under the style of Sparrow & Co., at 8, Longsmith Street, Gloucester.—Last day for receiving proofs for dividend 16th December. Trustee, Mr. G. W. Sisman, 26, Baldwin Street, Bristol, 1, Official Receiver.

Burrough Electric Co., 1, Church Street, Watford, Herts, electrical engineers and contractors.—Receiving order made 1st December on a creditor's petition.

MINIATURE BUSBAR TRUNKING

RATING 100 AMPS.

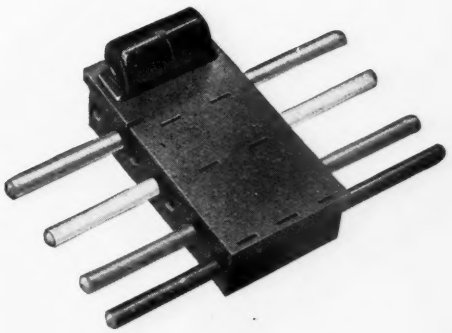
British Patent Application number 20579/54 Foreign Patents Pending



Busbar Trunking is unquestionably the best method of distributing electric power in machine shops, and wherever power is required at numerous points.

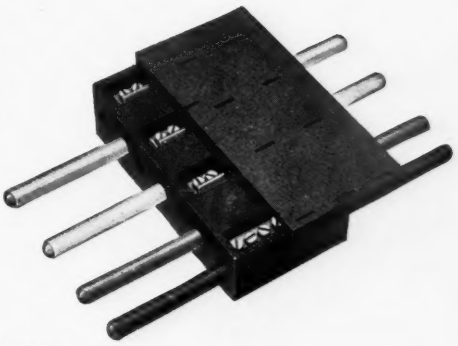
Ottermill MINIATURE Busbar Trunking has been specially designed to meet the practical requirements of the smaller installation. It is not a medium current or heavy current system scaled down.

A "take off" or "tapping position" is provided every two feet along the Busbar Trunking, and power connections can be made at these points in a matter of minutes. Each position is fully furnished with a combination fuse unit which can be made "alive" by the insertion of H.R.C. Fused Carriers. Fused tapping boxes and additional equipment are not required.

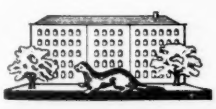


Connections from the Busbars to external load can be made in perfect safety with the Busbars "alive", for the Busbars are all insulated, and access to the outgoing terminals of the combination fuse units is barred by interlock unless all fuses are withdrawn. The Busbars of this Miniature system are rated at 100 amps., but when fed at the mid electrical point are suitable for 200 amps. continuous working load.

The Miniature Trunking system is standardized in 12 ft. and 6 ft. lengths. Accessories such as Right Angle Bends, Incoming Cable Units, etc., are equally standard.



Please write for catalogues:—
Miniature Busbar Trunking (100 amps.) leaflet MBT.971.
Busbar Trunking (200–600 amps.) catalogue BBT.971.
Cable Trunking leaflet CT.971.



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BURDETTE'S
Electrical Services

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 0d each including postage) will be obtainable after 18th January from the Patent Office, 25, Southampton Buildings, W.C.2.

1950

14365. Marconi's Wireless Telegraph Co., Ltd.—Radar systems and analogous pressure wave systems. 11th May, 1951. (743521.)

23949. British Broadcasting Corporation. —Television. 1st October, 1951. (743402.)

1951

5674. British Broadcasting Corporation.—Electronic switches. 10th March, 1952. (743403.)

15420. Marconi's Wireless Telegraph Co., Ltd.—Radio transmitting installations. 11th March, 1952. (743473.)

22187. Standard Telephones & Cables, Ltd.—Tinned copper wire. 12th September, 1952. (743404.)

22188. Standard Telephones & Cables, Ltd.—Electroplating equipment. 12th September, 1952. (743405.)

25018. Resistance Welders, Ltd., and Cumming, W. R.—Apparatus for electric flash butt welding. 20th October, 1952. (743574.)

1952

4514. Leech, H. C.—Combined electric torch and fluid projector. 20th February, 1952. (743480.)

6387. Standard Telephones & Cables, Ltd.—Electrical measuring equipment. 12th March, 1953. (743646.)

9091. Standard Telephones & Cables, Ltd.—Recording reflecting instruments. 1st April, 1953. (743577.)

10493. Pye, Ltd.—Reproduction of colour television signals. 24th April, 1953. (743648.)

11228. Electric & Musical Industries, Ltd. —A.c. coupled amplifiers especially for oscilloscopes. 20th April, 1953. (743481.)

13201. Philips Electrical Industries, Ltd. —Voltage regulating circuits. 15th May, 1953. (743524.)

22964. British Insulated Callender's Cables, Ltd.—Installations of electric capacitors. 11th September, 1953. (743482.)

24693. Cinema-Television, Ltd.—Electrical counting apparatus. 2nd October, 1953. (743528.)

26088. Philips Electrical Industries, Ltd. —Circuits for amplifying electrical oscillations. 17th October, 1952. (743585.)

27990. General Electric Co., Ltd., and Asher, P.—Apparatus for measuring electrical resistance. 3rd November, 1953. (743654.)

31087. British Broadcasting Corporation. —Electron discharge valve amplifiers. 22nd January, 1954. (743588.)

31392. Philco Corporation.—Cathode-ray tubes. 11th December, 1952. (743409.)

1953

3141. National Research Development Corporation.—Electrical signal storage apparatus. 29th January, 1954. (743416.)

4249. Adamson, R. A.—Electrically heated soldering irons. 16th February, 1954. (743664.)

4681. General Electric Co., Ltd., and Beesley, J. H.—Means for mounting electrical components. 16th February, 1954. (743490.)

5567. Standard Telephones & Cables, Ltd.—Electron velocity modulation apparatus. 27th February, 1953. (743593.)

6342. Marconi's Wireless Telegraph Co., Ltd.—Multiple beam aerial arrangements. 22nd February, 1954. (743533.)

6442. General Electric Co.—Luminescent screens. 9th March, 1953. (743419.)

6746. Rotol, Ltd.—Systems for controlling d.c. electric motors. 10th March, 1954. (743669.)

6817. Diversey Corporation.—Electrical conductivity testing apparatus. 12th March, 1953. (743534.)

8893. British Thomson-Houston Co., Ltd.—Position servo control system. 18th February, 1954. (743671.)

9683. Harley, M. C.—Electric lampholders. 9th April, 1954. (743422.)

10009. Saunders-Roe, Ltd., Davies, G. N., and Moss, F. P.—Phase meters, applicable to torque measurement. 24th December, 1953. (743675.)

10416. Westinghouse Brake & Signal Co., Ltd., Sykes Interlocking Signal Co., Ltd., W. R., Mackean, L. G., and King, V. S.—Block signalling systems for railways and the like. 14th April, 1954. (743540.)

10734. Du Pont de Nemours & Co., E. I. —Insulating material for electrical apparatus. 20th April, 1953. (743497.)

11062. Westinghouse Brake & Signal Co., Ltd., Peter, L. H., and Sheppard, E. A.—Metal rectifier assemblies. 3rd March, 1954. (743678.)

11108. Barclays Bank, Ltd., and Murland, J. R. W.—Electrical control systems suitable for use in hospital wards. 22nd April, 1954. (743499.)

11298. Electric & Musical Industries, Ltd. —Focusing of cameras, especially television cameras. 26th April, 1954. (743542.)

11452. Marconi's Wireless Telegraph Co., Ltd.—Repeaters for duplex communication. 19th March, 1954. (743500.)

11881. General Electric Co., Ltd., and Nixon, R. D.—Cathode-ray tubes. 29th April, 1954. (743426.)

13476. Birmingham Small Arms Co., Ltd. —Electric generators. 13th August, 1954. (743545.)

13600. Duke, G. E., and Nicholson, C. H. —Electric control systems for circuit-breakers and the like. 17th May, 1954. (743428.)

13601. Duke, G. E., and Nicholson, C. H. —Electrical control systems. 17th May, 1954. (743429.)

14079. Compagnie Générale de Télégraphie sans Fil.—Picture and/or picture signal producing electron discharge tubes. 19th May, 1953. (743431.)

14650. British Oxygen Co., Ltd.—Electric arc welding. 14th May, 1954. (743686.)

15029. Telefonaktiebolaget L. M. Ericsson.—Electromagnetic relays. 29th May, 1953. (743547.)

17086. Marconi's Wireless Telegraph Co., Ltd.—Television transmitters. 20th May, 1954. (743689.)

17854. Telegraph Construction & Maintenance Co., Ltd.—Electrical submarine cable repeater apparatus. 22nd June, 1954. (743439.)

18686. Fusarc, Ltd.—Electric arc welding. 24th June, 1954. (743555.)

20327. Electric Storage Battery Co.—Machines for the manufacture of battery grids. 22nd July, 1953. (743694.)

20616. Reyrolle & Co., Ltd., A.—Mountings for electro responsive devices. 23rd July, 1954. (743604.)

23685. Cinema-Television, Ltd.—Methods of and apparatus for sealing electrical conductors through glass. 23rd September, 1954. (743698.)

23857. Glass, M., and Tiller, D.—Apparatus for reproducing sound recordings on tapes, wires or the like. 30th August, 1954. (743448.)

24370. Research Corporation.—Electric pulser circuits. 3rd September, 1953. (743566.)

24381. West & Co., Ltd., A., and Stacey, J. R.—Control of polyphase a.c. motors. 25th August, 1954. (743511.)

24676. Radio Corporation of America.—Diffusion type semi-conductor devices. 7th September, 1953. (743608.)

25180. Western Electric Co., Inc.—Impedance converting devices employing transistors. 11th September, 1953. (743450.)

26877. Steatit-Magnesia Akt.-Ges.—Electric condensers. 30th September, 1953. (743700.)

30782. English Electric Co., Ltd.—Induction disc type electrical relays and instruments. 5th November, 1954. (743457.)

34760/1/4. Philips Electrical Industries, Ltd.—Manufacture of permanent magnets. 14th December, 1953. (743634/5/6.)

34810. Compagnie Generalé de Télégraphie sans Fil.—Travelling wave oscillator tubes. 14th December, 1953. (743519.)

35181. General Electric Co., Ltd.—Electric fans. 17th December, 1953. (743638.)

35285. General Motors Corporation.—Stop-on signal tuner devices for radio receivers. 18th December, 1953. (743466.)

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 23rd December:—

ROTALITE. No. 737,936, Class 7. Electric generators; and electric ignition devices for internal combustion engines.—Joseph Lucas, Ltd., Great King Street, Birmingham, 19.

ELEQUIP. No. 745,575, Class 7. Electric generators; and power-operated pumps.—Electrical Equipment Co. (Leicester), Ltd., 106, London Road, Leicester.

ZENTRAMATIC. No. 745,152, Class 7. Drying machines.—Hotpoint Electric Appliance Co., Ltd., Crown House, Aldwych, London, W.C.2.

EVER READY. No. 735,595, Class 9. Semiconductors for use in electronic apparatus.—Ever Ready Co. (Great Britain), Ltd., Hercules Place, Holloway, London, N.7.

PYETRONIC. No. 741,068, Class 9. Radar, echo-sounding, nautical, signalling, navigational, radio, television and telecommunication apparatus and instruments; acoustical apparatus and instruments; gramophones, gramophone pick-ups, microphones, amplifiers, loudspeakers, sound records, electric oscillation generators, germanium diodes, transistors and electric semi-conducting materials; and parts and fittings.—Pye, Ltd., Radio Works, St. Andrews Road, Cambridge.

REMOCCO. No. 744,085, Class 9. Electric floor polishing machines for domestic use, and vacuum cleaners and parts and fittings for these goods.—Fillerys (Great Britain), Ltd., 101-109, Ladbroke Grove, London, W.11.

ELECTROSTAR. No. 745,346, Class 9. Electric suction cleaners and domestic electric floor polishing machines and parts and fittings.—Bylock Electric, Ltd., 109, South Street, Enfield, Middx.

DUBAND. No. 745,367, Class 9. Aerials and parts.—Shardlow Electric Wires, Ltd., Corn Exchange Buildings, Hanging Ditch, Manchester, 4.

DUNLOBAT. No. 745,402, Class 9. Electric batteries and accumulators.—Dunlop Battery Co. (Ayrshire), Ltd., 9, St. Dunstan's Hill, Sutton, Surrey.

CALOMATIQUE Z. No. 745,384, Class 11. Electric heating elements. — Electric Bedwarmers, Ltd., Quality Works, Commercial Street, Hebden Bridge, Yorks.

Television Society's Exhibition

It is announced by the Television Society that its annual exhibition has been put forward from 5th January to 6th March next, when better accommodation will be available.

CHRISTMAS LIGHTING

The Christmas decorations in Regent Street, the buildings of which are floodlit by G.E.C. fittings

One of the attractions of London's Christmas decorations is the Regent Street scheme which consists of some 1,200 "snow crystals" made of expanded aluminium. Designed by Beverley Pick, F.S.I.A., and made by W. S. Crysaline, Ltd., of Berkhamsted, the crystals are of ⅛in mesh, varying in size from 2ft to 4ft in diameter and hung with silver glitter discs. They are suspended from roof-top cross-street carrier wires and some are painted in fluorescent colour. They form a very striking decoration, particularly at night when they are floodlit.

The scheme for floodlighting the buildings in Regent Street and the canopy of "snow crystals" was sponsored by the Regent Street Association. It has been installed by the General Electric Co., Ltd., in conjunction with the London Electricity Board. It incorporates 162 specially made floodlights housing "Osram" 1,500 W angle burning G.L.S. lamps. Since the floodlights have to be mounted vertically, being fixed to walls or balustrades, they had to be designed to throw their beams accurately to predetermined points on the opposite side of the street.

During focusing, particular attention was given to obtaining a uniform standard of illumination across the front elevation of each individual building. To prevent glare in the eyes of motorists and passers-by, the lamps have a sharp cut-off, and the units are fitted with louvres. The louvres are of aluminium, sandblasted and dyed black. The floodlights are installed at intervals of approximately 30ft and are at first and mezzanine floor levels.

In Southampton, at the new factory of Dimplex, Ltd., a big Christmas tree with strip lighting and a mass of gaily coloured lights has been installed. The tree is on the flat roof of the two-storey office block fronting the new Dimplex factory.

The whole of the face of the Oxford Street store of Selfridges, Ltd., is flooded by "Atlas" electronically-controlled fluorescent colour lighting. The building is bathed in pools of constantly changing colour, blending and contrasting in greens and reds and yellows and blues enhancing the architectural features of the building and creating an air of gaiety for the Christmas season. All the fluorescent tubes are automatically operated by thyratron units producing pleasing patterns of light. The scheme has been designed and installed by the theatre lighting division of Thorn Electrical Industries, Ltd., in co-operation with Mr. T. Young, the chief electrical engineer of Selfridges.

Catalogues and Lists

CONTROL GEAR.—Illustrated folder describing equipment manufactured by the company for the control of mechanical handling plant.—**Allen West & Co., Ltd.**, Lewes Road, Brighton.

COOKER TIMER.—Explanatory leaflet in the shape of the "Cookalone" auto control unit describing the features of this timer.—**Jackson Electric Stove Co., Ltd.**, 143, Sloane Street, London, S.W.1.

FURNACES.—Booklet describing the "carbonitriding" process of casehardening steel with particulars of rotary drum and shaker hearth furnaces manufactured for this purpose by the company.—**Wild-Barfield Electric Furnaces, Ltd.**, Elecfurn Works, Otterspool Way, Watford, Herts.

HEATING.—Two leaflets and a price list dealing with oil-filled, thermostatically controlled electric radiators.—**Dimplex, Ltd.**, Totton, Southampton.

Illustrated priced folder covering the company's standard range of electric fires.—**Carron Company**, Carron, Falkirk.

INSULATION TESTERS. — Illustrated, descriptive folder forming a guide to the correct choice of instrument from the company's range of insulation test sets.—**Evershed and Vignoles, Ltd.**, Acton Lane Works, Chiswick, London, W.4.

PHOTO-ELECTRIC EQUIPMENT.—Broadsheet describing and illustrating some of the company's standard photo-electric and electronic control equipment.—**Radiovisor Parent, Ltd.**, 1, Stanhope Street, London, N.W.1.

PLUGS AND SOCKETS.—Pamphlet (935) dealing with the range of "Easigo" metalclad protected type plugs and sockets.—**A. Reyrolle & Co., Ltd.**, Hebburn, Co. Durham.

PULVERIZING MILLS. — Descriptive booklet (8301) dealing with the company's electrically driven screenless superfine reduction mills for pulverizing soft or medium-hard materials.—**Sturtevant Engineering Co., Ltd.**, Southern House, Cannon Street, London, E.C.4.

REFRACTORIES.—Folder describing the company's silicon carbide refractories.—**Morgan Refractories, Ltd.**, Neston, Wirral, Cheshire.

THERMOSTATS.—Folder dealing with the Kieft plug-in type thermostat.—**Cyril Kieft & Co., Ltd.**, Thermostat Division, 13, Dudley Road, Wolverhampton.

Left: Selfridges floodlit by "Atlas" fluorescent coloured lighting and (right) Christmas atmosphere at the Dimplex Southampton office

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Australia.—24th January. Director, Posts & Telegraphs, Melbourne. Switchboard cordage. (E.S.B. 25989/55. Ten/16950.)*

Bridlington.—9th January. Borough Council. Re-equipment of Burton Agnes pumping station with four sets of horizontal electrically driven centrifugal pumping plant and ancillary equipment. Water engineer, Marton Road.

Canada. — 22nd December. Manitoba Hydro-Electric Board, Winnipeg. Thirty 115 kV disconnecting switches. (E.S.B. 26107/55. Ten/16965.)*

Formosa.—9th January. Central Trust of China, Taipei. Heater lamps, power transformers, etc. (E.S.B. 26626/55. Ten/17002.)*

Galway.—6th January. Eire Commissioners of Public Works. Electrical installation in St. Macdara's National School, Carranoe. J. Tyrrell, Secretary, Office of Public Works, Dublin.

Ilford.—9th January. Borough Council. Small g.l.s. lamps for one year from 1st April, 1956. E. J. Mulder, borough surveyor, Town Hall.

India.—30th December. Government Electricity Department, Madras. 757 distribution transformers, ranging from 50 to 250 kVA. (E.S.B. 26207/55. Ten/16952.)*

29th February. Central Stores Purchase Organization, Bombay. Four 87,500 h.p. turbines, coupled to four 70,000 kVA generators, and one 2,000 kVA house turbo-generator. (E.S.B. 26274/55. Ten/16968.)*

Keynsham.—16th January. U.D.C. Electrical installations in 120 dwellings on the Parkwest (Extension) estate. (See this issue.)

Leyton.—2nd January. Borough Council. Centrifugal sewage pump with electric motor and vertical shafting, automatic control equipment, wiring, etc. Borough engineer, Town Hall, Leyton, London, E.10.

Limerick.—13th January. County Council. Electrical installation in court house. P. J. Sheahan, architect, 47, O'Connell Street.

London.—2nd January. Finsbury Borough Council. Electric lamps for year commencing 1st April next. Borough engineer, Town Hall Annexe, Rosebery Avenue, E.C.1.

Louth.—31st December. Regional Vocational Committee. Electrical installation in extension to Bush Vocational School. J. V. Tierney, consulting engineer, 15, Duke Street, Dublin.

Nicaragua. — 3rd February. Empresa Nacional de Luz y Fuerza. Supply and installation of materials and equipment required for 110 miles of 69 kV transmission lines, 57 miles of 13·2 kV transmission lines, seven substations totalling 37,000 kVA, and distribution systems for 15 towns. (E.S.B. 14277/55. Ten/16932.)*

Pakistan.—26th December. Post & Telegraph Department, Karachi. Electrical and electronic testing instruments. (E.S.B. 26078/55. Ten/16954.)*

28th December. Trunk exchange equipment. (E.S.B. 26079/55. Ten/16978.)*

Portuguese East Africa.—26th December. Ports, Railways & Transport Department, Lourenco Marques. Transformers and switchgear. (E.S.B. 26569/55. Ten/17000.)*

Rhodesia & Nyasaland.—Federal Hydro-Electric Board, Salisbury. 330 kV cable and ancillary cable, shunt compensating reactors, and main and auxiliary switchgear for the Kariba hydro-electric scheme. (See this issue.)

6th January. Electricity Supply Commission, Salisbury. Circuit-breakers. (E.S.B. 26318/55. Ten/17001.)*

20th January. Rhodesia Railways Purchasing Board, Bulawayo. Two electrically heated core drying ovens. (E.S.B. 26058/55. Ten/17017.)*

South Africa.—6th January. Stores Department, South African Railways, Johannesburg. Electric cable. (E.S.B. 26177/55. Ten/16937.)* Copper wire and underground armoured cable. (E.S.B. 26702/55. Ten/17010.)* Electrical signalling cable. (E.S.B. 26703/55. Ten/17008.)*

Stirling.—County Council. Trunk road lighting schemes. (See this issue.)

United States.—4th January. Bureau of Reclamation, Denver, Colorado. 11,250 kW generator for Roza power plant. (E.S.B. 26129/55. Ten/16969.)* Two 13,333 kVA generators for Glendo power plant. (E.S.B. 26126/55. Ten/16977.)*

Wandsworth.—28th December. Borough Council. Polythene insulated armoured cable. (See this issue.)

Worsley.—31st December. U.D.C. Electrical fittings to replace existing gas fittings in the conversion of gas-light street lamps. L. T. Broome, surveyor, Town Hall, Walkden.

* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

ORDERS PLACED

Cardiff.—City Council. Rewiring of the electrical installation at Roath abattoir (£2,050).—J. B. Saunders.

Clay Cross.—U.D.C. Recommended. Group "A" lighting units along a section of trunk road A.61 (£1,468).—Revo Electric Co.

Darlington.—Town Council. Accepted. Supply of cast-iron lighting standards (£6,430).—G.E.C. Cables and jointing for the installation of lighting in additional streets in the town (£2,704).—North Eastern Electricity Board.

Durham.—County Education Committee. Accepted. Electrical installations at Kimblesworth County Mixed School (£755).—Armstrong and Ryan. Renewal of installation, etc., Washington Biddick County School (£1,444).—R. Robson.

Glasgow.—Corporation Education Committee. Accepted. Electrical installation work at primary schools and janitors' houses at Drumchapel (£11,756).—James Scott & Co. (Elec. Engrs.), Ltd. Electrical installation work at the primary school and janitor's house at Ruchazie (£3,811).—Claud Hamilton, Ltd.

Ripley.—U.D.C. Recommended. Installation of sodium and fluorescent type Class "A" lighting on the Sheffield/Derby trunk road A.61 (£7,434).—North Midlands Engineering Co.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Bakewell.—Additions to grammar school (£60,000); county architect, St. Mary's Gate, Derby.

Barrow-in-Furness. — Swimming bath; Wadham & Parker, architects, 111, Duke Street.

Bath.—Eight shops and 34 houses, on the Foxhill housing estate; city planning officer, 7, North Parade Buildings.

Bathgate.—R.C. primary school; Alison Hutchison & Partners, architects, George Street, Edinburgh.

Bedlington.—Factory additions for Welwyn Electrical Laboratories; Hastie D. Burton, Ltd., builders, King Street, North Shields.

Belfast.—Hospital for women and children, Dundonald; Frederick Gibberd, architect, 8, Percy Street, London, W.1.

Berkhamsted.—Library, classrooms, science laboratories, etc., Ashlyns School (£87,800); county architect, County Hall, Hertford.

Billingham-on-Tees.—Twenty bungalows, Grosvenor Road; H. A. Dawson, Ltd., builders, Chapel Road.

Shops, Town Square and Queensway, for Ravenseft Properties, Ltd.; Fewster and Partners, architects, 22, Conduit Street, London, W.1.

Houses (50) for the U.D.C.; Stephen Coates, Ltd., builders, North Ormesby, Middlesbrough.

Birmingham.—Erection of Handsworth Church Lane Boys' Modern School, for E.C.; Percy W. Cox, Ltd., Grove Lane.

Blackpool.—Extensions to factory of George Cheswick, Ltd., Mowbray Drive; Atherton Bros. (Blackpool), Ltd., 70, Peter Street.

Bradford.—Office block, Gledhill Road; F. Shepherd & Son, Ltd., builders, Blue Bridge Lane, York.

Brecon.—Council chamber and offices (£86,000); T. J. Williams, county architect, Brecon.

Bridgwater.—Civic centre, shops, houses, etc., as redevelopment of the West Street area; houses (70), on the Sydenham estate; borough surveyor, Town Hall.

Brierley Hill.—Central depot at The Leys, for U.D.C.; Percy Cox (Builders), Ltd., Park Road, Quarry Bank, Staffs.

Bromley. — Branch library, Chatterton Road; borough engineer.

Bury.—Casualty department at the General Hospital (£59,310), for Manchester Regional Hospital Board; architect to the Board, Cheetwood Road, Manchester, 8.

Cardiff.—Dance hall in Wood Street; Mecca, Ltd., 76, Southwark Street, London, S.E.1.

Chester.—Houses and flats at Upton-by-Chester; T. C. R. Eaton, 16, White Friars.

Chesterfield.—Houses (277) during 1956; borough architect.

Workshops, offices, showrooms, etc., in Old Road; Derbyshire Tractor Service, 6, Sydney Street, Brampton.

Chester-le-Street.—Houses (198), at Great Lumley, for the R.D.C.; F. Bowman, Council architect.

Houses (52), Pelaw Bank, for U.D.C.; W. Ridley, surveyor, Front Street.

Congleton.—County grammar school in Holmes Chapel Road; J. G. Kellett, director of education, City Road, Chester.

Croydon.—Six-year scheme for housing development at the New Addington Golf Course site, providing for over 1,000 dwellings, community centre, etc.; E. Taberner, town clerk, Town Hall, Katharine Street.

Offices in Wellesley Road; Phœnix Assurance Co., Ltd., Phœnix House, King William Street, London, E.C.4.

Cudworth.—Hotel for Smith's Brewery, Ltd.; Fairhurst and Poppleton, architects, 7, Regent Street, Barnsley.

Darlington.—Shops, fronting the Kings Head Hotel; Wetherell and Lamb, architects, 42, Victoria Road.

Deal.—Fire station and houses (£49,550); county architect, Springfield, Maidstone.

Deptford.—County secondary school in Beechcroft Road for L.C.C.; Dr. J. L. Martin, Architect's Department, County Hall, Westminster Bridge, London, S.E.1.

Doncaster.—Branch library, Cantley estate; borough architect.

Durham. — School, Woodhouse Close, Bishop Auckland; W. and T. R. Milburn, architects, 18, Fawcett Street, Sunderland.

Occupation centre, School Street, Hebburn, for the C.C.; county architect, South Street.

Eccles.—St. Patrick's R.C. Secondary Modern School; James Cocker (Contractors), Ltd., Station Sawmills, Walkden.

Ellesmere (Salop).—Factory in Grange Road; Fullwood & Bland, Ltd., rennet manufacturers, Fullwood Works.

Enfield.—Works extensions; Arlington Motor Co., Ltd., High Road, Ponders End.

Eston.—County modern school; Sheppard & Partners, architects, Bedford Place, London, W.C.1.

Exeter.—School, Beacon Heath (£81,816), for City Council; John Brierley, city surveyor, 7, Southernhay West.

Felling (Co. Durham).—Methodist Church at Wardley; D. Glen, Ltd., builders, Albert Road, Jarrow.

Glossop (Derbys).—R.C. school; Reynolds & Scott, architects, 9, Albert Square, Manchester.

Gosforth.—Houses (78) near Aln Avenue, for the U.D.C.; R. Bowey and Son, builders, 34, Great North Road, Newcastle-on-Tyne.

Houses on 30 acres of land for J. T. Bell and Sons, builders and contractors, 7, Northumberland Place, Newcastle-on-Tyne.

Guisborough. — Additions to grammar school; J. Breakwell, architect, St. Helier, Jersey, Channel Islands.

Halesowen.—Hasbury Farm C.P. Junior School; W. Cooper & Son (Builders), Ltd., West Street, Blackheath, Birmingham.

Houses (102), on the Furnace Park estate; A. T. Butler & Partners, architects to B.C., 31, Priory Street, Dudley.

Factory; Mirroware, Ltd., 249, Edgware Road, London, W.2.

Hastings.—Dwellings (78), Down Farm estate; Ringmer Buildings Works, Ltd., Ringmer, Lewes.

Hebburn.—Methodist church, Burnheads Road; R. Hudson and Son, builders, St. Mark's Crescent, Sunderland.

Hendon.—Flats (168), North Circular Road and Claremont Road; borough engineer.

Works extensions; Magneto Repairs, Lighting & Ignition Co., Ltd., Cricklewood Lane.

Hexham.—Sixty one-bedroomed flats on the Causey Hill estate; W. A. Hancocks, U.D.C. surveyor.

Hinckley (Leics). — Council offices (£135,000); Council's architect.

Houghton-le-Spring.—Central depot for U.D.C. (£25,000); A. Veitch, surveyor.

Hove.—Flats (36), Kingsway; Unicos Property Corporation, Ltd., 43, North Audley Street, London, W.1.

Huddersfield.—Hospital at Green Lea, for Leeds Regional Hospital Board; P. Nash, architect to the Board, Park Parade, Harrogate.

Ilford.—Secondary school, Forest Road (£140,000); borough engineer, Town Hall.

Public baths, Barkingside; borough engineer.

Isle of Wight.—Chalets (90) and ballroom, Lamblease Copse; F. Pontin, Little Canada Holiday Camp, Wootton Bridge.

Jarrow-on-Tyne.—Houses (50) at Calf Close Lane, for the T.C.; direct labour.

Kidderminster.—Comberton C.P. School; A. H. Guest, Ltd., Stourbridge.

Leicestershire.—Hostel, including lecture rooms and administrative block, at Brooksby Hall Farm Institute, Rotherby; county architect, 123, London Road, Leicester.

Liverpool.—Alterations to Hesketh Park Hydro to form convalescent hospital, for Regional Hospital Board (£44,924); Brook Constructions (Liverpool), Ltd., 3, Blake Street.

London.—Office block, Cromer Street, St. Pancras; Unity Structures, Ltd., 35, Tavistock Square, W.C.1.

Flats (168), Hanbury Road, Acton; borough engineer.

Multi-storey offices, South Bank, Lambeth; Shell Petroleum Co., Ltd., Shell Mex House, W.C.2.

New library for Benchers, Middle Temple; Dove Bros., Ltd., builders, Cloudesley Place, N.1.

Dwellings (124), Bostall estate, Woolwich; borough engineer.

Lowestoft.—Houses (40), on the Beeches estate; borough surveyor, 49, High Street.

Lytham St. Annes.—Extensions to confectionery works, back Carlton Road; Carshalton Confectionery (Blackpool), Ltd., Carlton Road.

Maidenhead.—First phase of scheme for girls' grammar school (£127,235) and first instalment of scheme for East Berks College (£75,400); county architect, Wilton House, Parkside Road, Reading.

Two secondary modern schools, Kenton estate; Spence and Price, architects, 26, St. Mary's Place, Newcastle-on-Tyne.

Malton.—Additions to grammar school; F. X. Velarde, architect, George Street, Liverpool.

Middlesbrough. — Departmental store; British Home Stores, Ltd., 129, Marylebone Road, London, N.W.1.

Middlesex.—First phase of extensions to Headstone Secondary Modern School, Harrow (£40,159), and final development of Trent Park Training College, Cockfosters (£195,875); county architect, 10, Great George Street, London, S.W.1.

Newhaven (Sussex).—Flats (30), Western Road housing site; U.D.C. surveyor, Council Offices.

Pembrokeshire. — Secondary school, Crymmych; county architect, County Offices, Haverfordwest.

Peterborough.—Hospital proposed in Midland Road (£1,500,000); East Anglian Regional Hospital Board, 33, Parkside, Cambridge.

Prudhoe (Northumberland).—Large additions to Prudhoe and Monkton Hospital; P. H. Knighton, chief architect to the Newcastle Hospital Board, Benfield Road, Newcastle-on-Tyne.

Stockport.—Chest clinic for Stepping Hill Hospital; Manchester Regional Hospital Board, Cheetwood Road, Manchester, 8.

Stokesley.—Housing estate (120 houses) at Nunthorpe Station; R.D.C. surveyor.

Welshpool.—Grammar school for County E.C.; county architect, County Offices, Welshpool.

West Hartlepool.—Stage 2 of Brierton County Secondary School; Cairns and Byles, consulting engineers, 8, Osborne Road, Newcastle-on-Tyne.

Wrexham.—Guildhall, for T.C.; Stephenson, Young & Partners, 6, Bluecoat Chambers, Liverpool.

Ceylon's Electrical Imports

Ceylon's electrical import trade, after expanding in value by 15 per cent between 1952 and 1953, fell off by about 10 per cent last year. The total for machinery was Rs.7,500,000, against Rs.8,820,000, and for goods and apparatus Rs.22,600,000, compared with Rs.24,400,000. The principal items are shown in the accompanying table, with notes of increases or decreases on the previous year; among the latter, wires and cables, telegraph or telephone apparatus (not radio), and machinery except transformers and convertors were outstanding. As the classification of radio imports has been amplified, detailed comparative figures are not available; total imports were valued at Rs.4,700,000, or about one-quarter more than in 1953.

Prospects of expansion of the electrical import trade seem fair. A loan has been granted to finance a second stage of the Laxapana hydro-electric scheme. The Government announced recently that there would be no nationalization or expropriation of any enterprises.

Class of Goods	1954 Rs.(000)	Inc.or dec. on 1953 Rs. (000)
Generators, alternators, dynamos and exciters	744	— 756
From U.K.	413	— 680
„ Germany	305	+ 239
„ U.S.A.	25	— 20
Motors	773	— 709
From U.K.	734	— 325
„ Italy	13	+ 12
„ U.S.A.	13	— 15
Transformers and convertors	1,923*	+ 675
From U.K.		
Control and switchgear	1,706	— 194
From U.K.	1,590	— 260
„ Germany	37	+ 33
„ Australia	34	+ 34
Electrical machinery, n.e.s.	2,397	— 299
From U.K.	1,258	— 186
„ Germany	140	+ 56
„ Netherlands	147	+ 107
„ U.S.A.	452	— 325
„ India		
Wireless and cables, rubber insulated	1,445	— 688
From U.K.	1,294	— 200
Ditto, other insulated	2,005*	— 1,105
Fluorescent tubes	173	+ 6
From U.K.	111	+ 7
„ Netherlands	35	— 9
„ U.S.A.	19	—
Electric torches	1,040	+ 124
From Hong Kong	967	+ 136
„ U.S.A.	65	— 6
Other lamp bulbs	833	+ 175
From U.K.	670	+ 166
„ Germany	73	+ 14
„ Netherlands	73	+ 10
Torch bulbs	177	— 43
From Hong Kong	43	+ 17
„ Netherlands	119	— 32

Class of Goods	1954 Rs.(000)	Inc.or dec. on 1953 Rs. (000)
Telegraph and telephone instruments and apparatus (exclu. batteries):		
Radio sets	2,852	†
From U.K.	1,532	—
„ Germany	292	—
„ Netherlands	978	—
„ U.S.A.	24	—
Radio transmitters	268	†
From U.K.	94	—
„ U.S.A.	174	—
Radio parts	1,553	†
From U.K.	1,212	—
„ Netherlands	137	—
„ Germany	48	—
„ U.S.A.	83	—
Other telegraph and telephone instruments and apparatus, exclu.batteries	1,058*	— 1,184
Batteries, dry, radio	903	+ 341
From U.K.	783	+ 300
„ India	109	+ 106
Ditto, other than radio	3,972	— 356
From U.K.	702	— 330
„ Singapore	3,047	+ 72
Other batteries and accumulators except splash-proof for motor vehicles	187*	+ 28
Cooking and heating apparatus	535	+ 71
From U.K.	483	+ 83
„ Germany	16	— 15
Electrical goods and accessories, not elsewhere specified	2,397	†
From U.K.	1,258	—
„ Germany	140	—
„ Netherlands	147	—
„ U.S.A.	452	—
„ India	203	—

* Mainly from U.K.

† Comparative figures not available.